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For Scale of Charges for Advertisements, see page xi.

For Table of Contents, see page iii.

We sent to Dr. Phipson several samples of pure beet and pure cane sugars for analysis. The results of his careful investigation he kindly gives us in a paper which will be found at page 11, and which will be read with some interest, especially by the jam manufacturers. The upshot of the matter seems to be that the preserve makers in buying beet sugar *may* be right, but in buying cane sugar they cannot be wrong.

We give at page 17, a most important letter addressed to Lord Salisbury, and largely signed by the most influential firms engaged in the Home and Colonial Sugar Trade. In it they express unhesitatingly their conviction that the coming into force of the proposed Convention will not raise prices above their present level: This authoritative statement cannot fail to have an important effect on Parliament when the Convention comes up for its ratification.

It may be asked, if the Convention is not likely to bring about higher prices, what advantage will it be to our cane growers? The answer will be found in the concluding paragraph of Mr. Lubbock's letter, which accompanies that of Lord Salisbury, and which we also give on page 17.

The London Correspondent of the *Glasgow Herald* states: that the reason why Mr. Labouchere did not care, notwithstanding his notice on the paper, to challenge on the 18th ult. the vote which covered the expenses in connection with the Sugar Bounties Conference, and thus consented to lose what was practically the last chance of raising the question this session, was that he knew if he did provoke a debate

and challenge the vote he would be badly beaten. Not only would he have had the whole of the conservative party against him, but a good many Gladstonians as well, including pretty nearly, if not quite all, the "labour representatives." Under these circumstances, Mr. Labouchere came to the conclusion that discretion is the better part of valour, and allowed the vote to pass.

Mr. Henry Tate, who recently presented Liverpool with a homœopathic hospital, and South Lambeth with a free library, and £21,000 to the Liverpool University College, has given £1,000 to the Liverpool Merchants' Guild for the relief of decayed gentlemen and gentlewomen, and £4,250 for providing five scholarships, four of them of the annual value of 18 guineas, in connection with the Liverpool High School, and one of 60 guineas for a High School scholarship, as a memorial of the late Rev. Hugh Stowell Brown. It is characteristic of Mr. Tate's catholicity of feeling that no restriction whatever, as to religious belief, is attached to any of these scholarships.

At page 13, we give an account of "Seedlings of Sugar Cane," taken from the *Kew Bulletin* of December. In reference to this very interesting subject Professor Harrison writes us—"I am of course aware that these seeds are generally considered to be infertile, but in my opinion the balance of evidence in this island (Barbados) is distinctly favourable to their being sometimes fertile. All of our most intelligent planters believe this, and one, at least, can produce evidence, not only of their fertility, but of the great vigour and productiveness of the canes obtained from them. At Dodd's we have succeeded in obtaining cross fertilisation of some of the varieties cultivated there, and now have sixty-one or two cane plants growing in this manner, consisting apparently of ten varieties, which upon careful comparison with those previously cultivated, show distinct, and in some cases marked variations from any of them. We have planted a twelfth of an acre with each of these sub-varieties, and intend to carefully investigate their permanence and yields. The canes springing from the yields resemble small tufts of grass at first, and are exceedingly delicate; we found it necessary to keep them frequently watered and protected from the direct rays of the sun during the first six or eight weeks of their growth; afterwards they grew vigorously. On the whole our experiments this year have confirmed those of previous years."

CUBA.—The *Havana Weekly Report* states that at Cienfuegos several sugar plantations, formerly working on the old system, have been turned into central factories. On the "Constanzia" estate at Lagna, arrangements have been made for a very large central factory.

A further test of the Electric Sugar Refining process, with completed plant, was made on December 3rd. The New York Correspondent of *The Financial News*, was present at it, and on page 41 we give the report which appeared in that paper of December 4th. On December 3rd the shares stood at 93 with 90 bid, immediately afterwards they jumped up to 125 with 120 bid—the latest quotation is 83 with 81 bid. Those who sold out when at 120 did well.

The New Orleans *Weekly Picayune* states that Germans are supplanting coloured labour in Louisiana, a large number having within the past two years been put to work, and there is urgent demand for more. They are employed in the field as well as in the manufacture of sugar to give great satisfaction, the estimate being made that one German is equal to two coloured men. While foreign labour is gradually supplying coloured labour in many localities.

We have pleasure in calling attention to a change which has recently been made in the old established firm of Manlove, Alliott & Co., so well-known in the Colonies as manufacturers of sugar machinery.

The business was established in 1837 by Mr. Edward Manlove and the late Mr. Alex. Alliott, and has recently been carried on by Mr. Edward Manlove and Mr. James B. Alliott under the style of Manlove, Alliott, Fryer & Co.

On the 5th November last the firm was converted into a private company, under the style of Manlove, Alliott & Co., Limited.

The change from a private firm to a company will involve no other alteration; the business will be carried on exactly as usual, and under the same management. The directors of the company are Messrs. Edward Manlove, James B. Alliott, John M. C. Paton, and E. A. Manlove. Their London house, which up till now has been at No. 90, Queen Victoria Street, E.C., will from this date be at No. 276, Winchester House, Old Broad Street, E.C.

There never was a time, probably, when the sugar machinist was so necessary to the cane sugar manufacturers than is the case at the

present time. With intelligent cultivation, and with improved machinery, cane can successfully compete with beet. We wish Messrs. Manlove, Alliott & Co., Limited, every success.

The *London Gazette*, of November 30, announces that from to-day the Colonies of Trinidad and Tobago shall be united into and constituted one colony, to be called the Colony of Trinidad and Tobago.

In consideration of the strong feeling entertained in Queensland, Sir H. Blake has resigned the governorship to which he has recently been appointed by the Colonial Office. The vacancy thus occasioned has been filled up by the appointment of General Sir Henry Wylie Norman, K.C.B. (1873) and C.I.E. (1878), who has been governor of Jamaica since 1883.

Queensland's loss is Jamaica's gain. Sir H. A. Blake has been appointed governor of the latter colony, in succession to Sir H. W. Norman. In the opinion of Lord Derby, who has had some experience of colonial affairs, and who is not given to extravagant statements, Sir H. A. Blake is one of the ablest men in the public service.

The Earl of Kintore, born 1852, and of no official experience, has been appointed Governor of South Australia on the retirement of Sir William C. F. Robinson.

The Agricultural Company of Mauritius, Limited, announces an interim dividend of 1s. per share, or at the rate of 10 per cent. per annum for the half year ending September 30.

The directors of the Colonial Bank have resolved to recommend a dividend of 5 per cent. for the half-year ended June 30th, being at the rate of 10 per cent. per annum.

We give below a summary of the dividends and net profits declared by various German Sugar Manufacturing Companies and Refineries at meetings held since our last issue. In no case has there been any loss on manufacturing, but some of the refineries have been working unfavourably, owing to the small margin between cost of raw sugar and selling price of refined.

Waghäusel (Baden) with a capital of M. 4,714,285, which grows its own beets and is also a large agricultural and cattle farming under-

taking, pays a dividend of 7%; *Bennigsen* (capital M. 683,100), pays 9%; *Neustadt O.S.* (capital, M. 750,000), 6 $\frac{2}{3}$ % on preference and 5% on ordinary shares; *Soest* (capital, M. 1,200,000), 6 $\frac{1}{2}$ %. The *Stuttgärdt Zuckerfabrik* declares 6% on preference and 5% on ordinary shares, but over two-thirds of the amount come from a fund created between 1883 and 1886 for the purpose of maintaining the dividends at a constant figure.

Tuchno (capital,—shares, M. 588,000; debentures, M. 510,000; mortgage loan, 300,000) has made a net profit of M. 195,907; *Kujawien* (capital, M. 900,000) shows M. 158,361; *Brakel* (capital, M. 1,242,000), M. 80,323; *Gross Gerau* (capital, M. 530,000), M. 79,679; *Brühl* (capital, M. 1,050,000), M. 33,189; *Othfresen* (ordinary shares, M. 343,700; preference shares, M. 562,500), only M. 7,008. The *Kreis-Julicher Factory* (of Amela) has made M. 37,381, which goes to reduce the loss of M. 380,225, sustained in the two previous campaigns.

As regards refineries, that of *Hildesheim* declares a dividend of 60%. The works were erected 1882-83, at a cost of M. 3,000,000, and started in October, 1883. During the 5 years, new buildings have been added at a cost of M. 55,000. The working expenses since starting, including repairs, amounted to M. 11,450,000, nearly three fourths of which were expended in *Hildesheim* and the neighbourhood. They employ 600 workmen, (exclusive of clerks and officials) and the average wage has been M. 843 per annum. The concern has paid in dividends 100 per cent. on the share capital, or an average of 20% per annum.

On the other hand, the *Erste Schlesische Pile Raffinerie* at Breslau has lost M. 94,117; *Braunschweig* only pays a dividend of 1%; *Brunonia* (Brunswick) only 3%, and *Halle* 6%. The average price paid last campaign by this latter refinery for raw sugar (92%) was M. 46.62 per metr. centner (23s. per cwt.), and the price obtained for loaves varied at the beginning of the campaign between M. 55 and M. 53 $\frac{1}{2}$ per metric centner (220 $\frac{1}{2}$ lbs.), rising afterwards to M. 61 $\frac{1}{2}$., falling in June to M. 56, and gradually improving, up to the end of July, to M. 58 $\frac{1}{2}$.

New factories are to be erected at Buttstädt (Thuringia), Atteringersleben (Brunswick), and Nauen (Brandenburg). Several new factories and one extensive factory and refinery are to be set up in Hungary, where the Government is actively promoting these undertakings.

The factory not long ago established (with some *éclat*) at Hochdorf, Canton Lucerne (Switzerland), has collapsed.

In the *Greenock Telegraph*, of December 27th, 1888, is a lengthy communication from Mr. T. Neill upon "What may be expected from the ratification of the sugar convention." Had we space we should have been glad to have given several extracts from it, as it is; we can only find room for the following, which is much to the point:—

"At present prices for cane sugar, namely, those corresponding with 14s. for 88 per cent. beet root sugar, the cane sugar producers are perfectly satisfied, and a profitable return for the money invested in sugar plantations is received. If cane sugar producers were not haunted with the dread of some European nation largely increasing its bounty and driving them out of the trade altogether, they would immediately set about adding and improving their sugar estates, the consequence of which would be a large increase in the production of cane sugar throughout the British colonies. The managing partner of one of our largest West Indian sugar producing firms, stated in presence of the writer, that at present prices they were perfectly satisfied. On being asked, Why, then, did they not extend their estates? he replied that it would be sheer folly for them to go into any heavy expenditure for machinery that would improve or increase their production when they did not know the day some Continental Government might take it into its head to give a bounty just large enough to enable the beet root *fabricant* to drive them out of the trade, and the money they had laid out in improving and increasing their production might as well have been thrown into the sea. He further stated, that at a meeting which he and his partners had, they discussed the question whether they would spend close on one hundred thousand pounds sterling in the improvement of the machinery of some of their sugar estates, or abandon them and allow them to go into "bush." At last he persuaded his partners, now that the Convention had been signed, and the almost certainty of it being ratified by the House of Commons, not to abandon the estates this year, but to wait, and if they saw that it was certain the bounties would be abolished, they could then resolve on the expenditure of the large sum necessary to provide all their sugar estates with the latest improvements in sugar machinery."

1888.

It is satisfactory to note a marked improvement in the sugar trade during the past year. As compared with 1887 and 1886, the average advance in the values of raw sugar is from 1s. to 2s. per cwt., and, with stocks all round at so low a level, and with the increase in the consumption, this improvement is likely to be maintained. At the same time, with ordinary crops, we see no prospects of prices being much higher than they are at present. We have, from time to time, given the results of the working of the German public sugar companies. Those for the past year (August, 1887, to July, 1888,) are very remarkable, dividends in many cases have been declared ranging from 30 to 50 per cent. This clearly proves that Germany, unaided by bounties, can go on producing sugar at a good profit at present prices.

Some misconception prevails in many quarters as to what is now the bounty in Germany. Taking as a basis, 13 per cent. yield in sugar, which is exceptionally high, the bounty is not quite 1s. 3d. per cwt.

The following figures show what the average prices of German 88% beet, of West India, and of Java sugars have been in each quarter of the year, for the past seven years.

GERMAN BEET 88%.

	1882.	1883.	1884.	1885.	1886.	1887.	1888.
First Quarter ..	21/6	20/-	17/1	11/5	13/7½	10/10	14/9
Second „ ..	22/9	21/3	14/7½	14/6	12/1½	11/8½	13/5
Third „ ..	22/3	20/7	13/6	15/2	11/1½	12/7	14/3
Fourth „ ..	20/3	18/9	10/6½	14/9½	10/9	13/7	13/3
Average for the } whole Year.. }	21/8	20/1½	13/11	13/11½	11/10½	12/2	13/11

WEST INDIA.

	1882.	1883.	1884.	1885.	1886.	1887.	1888.
First Quarter ..	21/1	19/10	16/7	11/4	13/6	10/8	13/6
Second „ ..	21/10	21/2	14/-	14/10	12/3	11/-	13/-
Third „ ..	21/6	20/2	11/4	14/10	11/4	12/-	13/-
Fourth „ ..	20/8	19/-	11/2	14/11	11/3	13/7	13/4
Average for the } whole Year.. }	21/3	20/-	13/3½	13/11½	12/1	11/9¼	13/2½

JAVA 14 D.S.

	1882.	1883.	1884.	1885.	1886.	1887.	1888.
First Quarter ..	25/5	24/-	20/8	14/7	15/4	13/2	16/1
Second „ ..	25/10	24/7	18/3	17/6	14/3	13/7	15/7
Third „ ..	25/7	24/1	15/8	17/1	13/3	13/10	16/1
Fourth „ ..	24/6	22/10	14/8	17/7	13/5	15/9	16/8
Average for the } whole Year.. }	25/4	23/10½	17/3½	16/8½	14/0¾	14/1	16/1½

As compared with five years ago, present prices show a reduction of 30 per cent. Notwithstanding this, such are the improvements during the past three years in the cost of production, our cane growers can hold their own and make money at present prices; and but for the disturbing influence of the bounty system, we should see capital freely going to our colonies, and as a result a largely increased production.

The International Sugar Congress, to which we alluded a year ago, after holding twenty-six sittings, concluded its labours on the 30th of August last. The result is a Convention, the articles of which (eleven in all) we gave in the *Sugar Cane* for October (page 517). This has been signed by all the important European powers, with the exception of France, whose Plenipotentiary makes the following declaration in the name of his government.

“The Government of the French Republic adheres in principle to “the Convention of the 30th August, 1888, respecting the suppression “of bounties, and reserves the right of adhering to it definitely in “accordance with Article VIII, after the adhesion of all the countries “producing raw or refined sugar, and after communication to it, of “the laws by which it is intended to afford complete and absolute “security against the granting of any open or disguised bounty on “the manufacture or export of sugar.”

Full of loopholes as this declaration is, we are sanguine that before the time comes for the ratification of this Convention (1st August, 1890), it will be found that France has given in her adhesion. The exigencies of the French exchequer, and the serious loss to her revenue from the bounty system, will have a powerful influence upon the government when called upon for its final decision.

The Convention has yet to be ratified by our Houses of Parliament, and if France in the meantime withdraws her reservations, it will help greatly to clear the way; *in any case*, if our government take their stand upon the question, we have no doubt as to the result. The letter recently written to Lord Salisbury, and so largely and influentially signed, and which we give elsewhere, will have a good effect upon doubtful members representing large constituencies with whom the cheap sugar arguments are all powerful.

“Diffusion,” as applied to cane, appears to be making headway. Mr. Quinton Hogg, who, about eighteen months ago, put down a diffusion plant on his Nonpareil estate, is now so far satisfied with the results obtained, that he is about to adopt this process on two other of his Demerara estates.

We had hoped to have given this month some important particulars of results obtained from an improved cane mill, but, owing to the unexpected death of the gentleman who had charge of it, we have not been able to do so. Assuming that the diffusion process is a success as compared with what has been done by the cane mill, it may not prove to be such a success, when compared with what can be done by the mill.

It was generally thought that during the year, there would be some reduction made in the duties upon sugar in the United States. The Mills Tariff Bill, which provides for a reduction of about 20% on sugars, was passed by the House of Representatives on 21st July, by 162 against 149. The republican party in the Senate brought in an amended bill by which sugar duties were to be reduced by 50%.

The Presidential Election coming on, nothing further was done—nothing can now be done before next December. If the question should then be taken up, no alteration then made would take effect before June, 1891; so that for the next 18 months the duties will remain as at present.

How far the republican amendment was a “move” in view of the Presidential Election remains to be seen. The republicans are now in office, and they are protectionists. We fear therefore that the advocates of the abolition or reduction of the sugar duties have an uphill fight before them. The sorghum men keep well to the front; they speak loudly of the great things which sugar from sorghum will bring about; beet sugar has made a fresh start, under very favourable conditions in California, but if the duties are abolished or even reduced by one-half, it means their annihilation—and there is no doubt the republican party will lend a friendly ear to such representations.

Mr. Lewis Ware, the editor of *Sugar Beet*, who has given most persistent attention to the question of beet sugar production in the United States, and is an authority on the subject, speaking of the high quality of the beets which have been supplied to the new beet factory at Watsonville (California), owned by Claus Speckels, says, “If the success in manufacturing is as great as the superior quality of the beet has proved, we may expect some surprising results; a fortune certainly awaits those who have the management of the 350 ton Watsonville factory.” Mr. Ware has, however, very little faith in the ultimate success of ~~“Sugar from Sorghum.”~~ At Watsonville the price paid for beets is

from \$6 to \$9 per ton—average \$7½, or 30s. per ton—assuming that it will take 8 tons of beet to make 1 ton of sugar, it means that the cost of the raw material required to produce one ton sugar at the factory is £12 per ton, or 12s. per cwt. If we take the price of German beet at 14s. f.o.b., add 1s. per cwt. freight, and say 10s. per cwt. duty, it amounts to 25s. per cwt.—here is a margin, for manufacturing expenses and profit of 13s. per cwt.—not a bad one.

Our refiners have shared in the general improvement, largely brought about by the lessened imports of foreign refined,—about 30,000 tons,—during 1888, and the increase in the consumption of about 50,000 tons. It is to be noted that London, so long the leading port for sugar refiners, has now to give place to Liverpool, whose imports and deliveries have surpassed those of London, whilst the stocks are some 65,000 tons larger. Notwithstanding the diminution in the number of refineries at work, the total output for 1888 is, with two exceptions, and one of them a very slight one, greater than in any previous year. What London has lost, Liverpool and Greenock have gained.

In the early part of the year a sugar “Trust” or ring was formed in New York, with the object of buying up the refineries in the United States, and so controlling the markets for both refined and raw sugars. Nine of the New York refineries and five of the Boston refineries entered the ring; the Philadelphia refineries kept out, and by so doing they reaped the advantage of the high prices brought about by this “Trust” without incurring the public displeasure. The sums said to be cleared by those who entered the ring are almost fabulous in amount. Such a state of things could not have existed but for the high duties upon foreign sugars. Like all monopolies, it will have its day and cease to be.

In March last, the “inventor” of Sugar Refining by Electricity, Mr. Frerd, died.—The “secret” has been confided to his widow, and the President of the Company—A refinery has since been fitted up, and two “demonstrations” have taken place, after each of which the shares rose rapidly, to be followed each time by a fall equal to the rise—the shares which went up to 125 a month ago are now at 83—We are now told that the company are taking out the necessary patents, and if this is really so, we shall soon know the truth about this company, whose ways hitherto have been, of a truth, past finding out.

REPORT OF EXPERIMENTS ON CANE AND BEET SUGAR.

By DR. T. L. PHIPSON, F.C.S., &c.

The object of this investigation was to determine by means of accurate experiments what difference existed between pure cane sugar and pure beet sugar.

Of late years it has been several times asserted that there exists a very notable difference between these two products, so much so, that the first has been termed *Saccharose* and the second *Betose*. We have also heard it stated on various occasions that beet sugar is not so profitable for making jams and preserves as cane sugar is, nor that it can be used as advantageously as the latter in various other circumstances. It came to be suspected, therefore, that cane sugar and beet sugar were really *isomeric*, but not identical; that is, have the same composition, but somewhat different properties, as we know to be the case with many other substances belonging to the group of sugars.

I pointed out some time ago how this question might be solved experimentally, but for that purpose it was necessary to have perfectly pure refined cane sugar, and equally pure beet sugar, *the origin of each of which could be guaranteed*. This was no easy matter, because it is customary to mix these sugars in refining, and it was some time before I could become possessed of samples of perfectly authentic origin, the one being pure cane, and the other pure beet sugar. Thanks to the very kind exertions of the Editor of the *Sugar Cane*, I have been able to make my experiments upon specimens which fulfilled the conditions alluded to. The first consisted of pure crystals of refined cane sugar from the West Indies, and the other absolutely pure crystals of Austrian beet sugar.*

Both these samples were in white, translucent crystals, of the *same form* (oblique prisms), and bearing the *same modifications* on the edges and angles. The crystals were in each case identical, except that those of the cane sugar were much the larger. In all the experiments made the *same weight* of each sugar was taken, in every instance. They were both devoid of odour, and when placed dry upon the tongue the cane was the sweeter of the two, though when *equal*

*The Editor of the *Sugar Cane* was good enough to send me a number of other specimens, with the exact origin of each duly noted, but for the present my observations relate simply to the two above mentioned, which fulfilled all the conditions I required, the one being *direct from the cane* and the other *direct from the beet*, without any admixture whatever in either case.

weights were dissolved in the same quantity of water, the sweetness was found to be absolutely identical.

Each of these specimens was found on analysis to give the composition :—

	Cane.	Beet.
$C^{12}H^{10}O^{10}$	99.76	99.88

They were, therefore, extremely pure.

Equal weights of each were dissolved in equal quantities of water, and the *specific gravity* of the two solutions, taken with the greatest care, gave absolutely identical results.

To test the viscosity and action of gravitation upon the two samples, equal weights were dissolved in equal quantities of water, and the solutions introduced into a large glass tube with an elongated bulb, containing exactly 1000 grain measures, and in communication with the instrument known as a *metronometer*. The liquid was allowed to run from the minute orifice of the tube, and the beats of the metronometer counted. In each case the 1000 grain measures of solution were delivered in exactly the same number of beats of the instrument, that is, in absolutely the same interval of time.

These *physical* results proving identical in each case, it became necessary to determine whether any difference would be discovered in the action of various *chemical* agents on the two specimens of sugar under examination.

For this purpose a very considerable number of experiments were made, which it would be far too long to notice here in detail, many of them having been repeated several times; but the results may be given in very few words.

In the first place, equal weights of each sugar were dissolved in the same quantities of water, and the solutions allowed to remain in the cold for three days after the addition of minute quantities of some *mineral acid*. The inversion was found to be perfectly alike in both cases.

Several other similar experiments were made, with identical results in each case, and finally I proceeded to the crucial test which I proposed some time ago, and which was likely to prove whether these sugars were unequally acted upon by the *organic acids* generally present in jams and preserves.

For this purpose the same weight of each sugar dissolved in the same quantity of water was acidified with a minute quantity of a solution containing equal parts of citric and tartaric acids. The two

test tubes of equal sizes, holding the solutions, were placed in a water-bath, at a temperature of 99° Centigrade, for the space of 20 minutes. The two solutions were then immediately analysed by means of Fehling's copper reagent as usual, and the *same amount of inversion* was found to have occurred in each case.

It remains only to conclude from the results of these experiments, that physically and chemically the two specimens of sugar were absolutely identical; and that when chemically pure, or nearly so, there is certainly no difference whatever between cane sugar and beet sugar.

How then are we to account for the preference universally given to cane sugar for the making of preserves, &c.? It can be explained in the following manner:—

If the impurities got rid of by refining were absolutely removed *in toto*, as in the case of the two specimens which have formed the subjects of my experiments, there would be no preference to be given to either. But in case of a partial purification only, *which is the general condition*, the impurities left behind in beet sugar are more noxious than those left behind in cane sugar; and as chemically pure sugar is never met with in practice, it is natural that those most interested in this subject should have determined to use cane sugar in preference to beet sugar in all circumstances.

SEEDLINGS OF SUGAR CANE AT BARBADOS.

From the *Kew Bulletin*, December, 1888.

The sugar cane is one of the most valuable economic plants we possess. It has been cultivated for so long a period that the primitive habitat of the species, according to De Candolle, is unknown.* Bentham, in *Flora of Hong Kong*, p. 420, states that "We have no authentic record of any really wild station of the common sugar cane." Further than this, in common with many plants that have been for a long time under cultivation and reproduced solely by means of buds and suckers, the sugar cane so rarely produces mature fruits that no one, as far as we are aware, has ever seen them. Certainly in the rich Herbarium at Kew there are no seed-bearing specimens. In botanical works the subject is often referred to, but apparently only to restate the fact that botanists like McFadyen in the West

* *Origin of Cultivated Plants* (1884), p. 755.

Indies and Roxburgh in India "have never seen the seeds of the "sugar cane."*

Schacht is one of the few persons who has given a good analysis of the flower of the sugar cane, including the pistil; he also had not seen the ripe seed.

In discussing the problem how far the saccharine qualities of the sugar cane could be improved on the same line as those so successfully adopted with regard to the beet, it was lately pointed out in a letter addressed to the Colonial Office that, owing to the power of producing fertile seeds having apparently been lost by the sugar cane, it was impracticable to deal with it by means of cross fertilization or by the ordinary course of seminal selection. It was further pointed out that new and improved varieties amongst sugar canes were to be looked for amongst bud variations, and planters were advised to mark any canes that showed a departure from the type, and cultivate them separately for experimental purposes, with a view to test their yield in sugar. Attention having thus been directed to the subject by official notices published in sugar-producing colonies, several communications have been received at Kew from persons who believe they were able to afford some information on the point whether the sugar cane produces seed or not.

First, as regards the actual seeds of the sugar cane. A correspondent at Fiji, in forwarding a small packet to Kew in April last, stated, "Some time ago there was published in the *Government Gazette* of this colony an extract from a letter from you in reference "to sugar cane seed. I have been eighteen years in sugar-producing "countries, and have never observed sugar cane seed until within the "last month when one of my sons brought me a head fully ripened "from a garden in my neighbourhood. Some time afterwards I went "to see the sort of cane from which the seed had been gathered, but "the plant was dug up, and I could only learn that it was a purplish "cane." The seed sent by this correspondent proved not to be the seed of a *saccharum* at all; it was the seed of a *sorghum*, and probably of *S. vulgare*, the common millet or guinea corn.

Recently, however, a statement has reached Kew, from a trustworthy source, that seedling sugar canes had been found at Barbados, and that plants were in course of being raised at the Botanical Station in that island, under the care of Professor Harrison and Mr. Bovell.

* *Hooker's Botanical Miscellany* (1830), Vol. I., p. 95, tab. 26.

Mr. J. B. Harrison is Island professor of chemistry and agricultural science at Barbados, and in conjunction with Mr. T. R. Bovell, who is superintendent of Dodd's Reformatory, he has been engaged for the last three years in cultural and chemical experiments with various kinds of sugar canes. The results of these experiments have been published officially by the Government of Barbados, and afford data of a valuable character as regards the effects of various manurial constituents applied to sugar canes, as also the relative merits of new and old varieties of canes now under cultivation in the West Indies.

The statement sent by Professor Harrison appears to prove, in a perfectly natural and circumstantial manner, that a few mature seeds may be occasionally produced by the sugar cane under certain circumstances. It is stated by Rumphius that the sugar cane "never produces flowers or fruit unless it has remained several years in a "stony place." He does not, however, say whether he ever saw the fruit, nor does he cite any proof of the fact in the shape of seedlings, self-sown or otherwise. The canes that would be likely to produce fruit would be those varieties nearest to the original wild cane, and probably on that account they would be less rich in sugar than the canes improved by a long course of cultivation.

Without expressing a decided opinion on the subject, and in the absence of the specimens themselves, the information supplied by Professor Harrison is, so far, the most tangible of any yet received to show that the cultivated sugar cane may occasionally produce mature fruits.

Government Laboratory, Barbados, 17th September, 1888.

On certain of the higher districts of the island from time to time growths of sugar cane resembling fine grass have been noticed, but in most cases no attempts have been made to cultivate them. Mr. Parris some years ago succeeded in raising a few canes from the cane arrow or flowering shoot. Mr. Clarke did the same with the arrow of the purple transparent cane, but did not succeed in getting the seedlings to flourish, and my wife's father many years ago succeeded in getting the arrows to produce young canes, but not in cultivating them. Knowing these cases, Mr. Bovell and myself considered that a favourable opportunity of examining into this question offered itself during the cultivation of the varieties of canes which we have here. These canes were planted in rows of four broad by 25 feet deep, and so as to have two sets of each kind, in all 36 plots of 18 varieties, planted side by side. The plots were noticeable this year for the

number of arrows sent up by some of the varieties. We gave strict orders to the labourers employed in weeding and watching the adjacent land to report to us any grasses springing up upon them in any way differing from the usual weeds. Towards the end of January they reported to us that a few tufts of grass different to the usual kinds were making their appearance. We found these to be growing in a rather narrow belt of the field on one side of the plots and in a little below it, following the direction of the prevailing wind. They were found not only on the surface of the field, but also on the bottom of a drain which had been dug in the field to a depth of eighteen inches. Some 80 or 90 plants sprung up at intervals afterwards. We found a good deal of difficulty in keeping them alive, as the sun quickly shrivelled them up; it was necessary to protect them in many cases from the direct rays of the sun, and to keep them constantly watered. In this way we succeeded in saving some 64 or 65 plants. Of these we carefully examined three or four, so as to ascertain as far we could the absence of any particles of old cane in them. Their mode of growth was quite different to that of canes growing from the eyes of canes. Sixty plants were successfully transplanted, and are being cultivated. At present they are not far enough advanced in their growth to speak with certainty, but there appears to be amongst them several different kinds, probably five or six at the least. If you think it worth while, Mr. Bovell and myself will send you a specimen cane of each sort in January or February next, when they will be sufficiently far advanced to show their characteristic. The way in which they first grow is quite sufficient to account for them not being often noticed upon the fields. The weather here during January last was particularly favourable for their growth, and the fact of different varieties being grown side by side is, of course, much more favourable for the production of seed than the growth of one variety only. I have never heard of the Bourbon cane producing here fertile arrows, in all the alleged cases of fertility the arrows were either those of the purple or white-transparent varieties which, as you are aware, are prone to variation. We shall again attempt this year to obtain the same results. I am anxious to have the benefit of your opinion upon this year's results, as of course, if we can establish the fact of the cane occasionally, and, under certain favourable conditions, producing fertile seed, it will open an important field of investigation.

J. B. HARRISON.

LETTER TO LORD SALISBURY,

LARGELY AND INFLUENTIALLY SIGNED, EXPRESSING THE CONVICTION THAT THE PROPOSED CONVENTION WILL NOT RAISE THE PRICE OF SUGAR ABOVE ITS PRESENT LEVEL.

Billiter House, London, E.C.,

11th December, 1888.

The Most Honourable THE MARQUIS OF SALISBURY, K.G., &c., &c.
My Lord Marquis,

I have the honour to convey to your Lordship the enclosed letter, embodying an expression of opinion by those entitled to speak with great authority upon the subject, as to the effect the abolition of bounties, provided for in the Convention, will have upon the supply of sugar in the United Kingdom, and the price to be paid by the consumer.

In commending this letter to your Lordship's kind attention I am to point out its thoroughly representative character, the signatures comprising those who are engaged in the sugar refining industry in the United Kingdom, as well as those interested in the growth and production of sugar in the British Colonies, and other countries, including the East Indies and Java, the West Indies and British Guiana, Mauritius, Natal, Queensland, New South Wales, Fiji, Cuba, and Brazil. The representatives of the engineering and other industries in the United Kingdom have also expressed their concurrence.

It may be asked, if we as producers, merchants, and traders do not believe that present prices will be raised by the abolition of bounties, why should we be so active in promoting that abolition. To such an enquiry we reply, that our interest lies not in raising prices but in depriving our competitors of the cash bounty, as an addition to the amount of the market price—whatever that may be,—which enables them to obtain a higher real price than our producers, and therefore to increase and improve their production to our detriment, while we are conversely, from the same cause, precluded from increasing and improving to the same extent. In short, our interest requires that all producers should recoup their cost of production solely and only from the market price of the whole world's competition, so that all producers may have the same opportunity and the same inducement to progress in proportion with the increase of consumption.

At present, whatever the price may be, we are still hindered, by the prospect of bounty-fed competition, from making the progress which under natural conditions we undoubtedly should make. So long as the price of sugar depends upon such uncertain and fluctuating con-

ditions as are brought about by the bounty system, prudent capitalists are necessarily reluctant to invest capital in the industry.

I have, &c.,

(Signed) N. LUBBOCK,
Chairman of the West India Committee and of the
British and Colonial Anti-Bounty Association.

30th November, 1888.

The Most Honourable THE MARQUIS OF SALISBURY, K.G., &c.
My Lord Marquis,

We venture respectfully to address your Lordship upon the main objection which has been raised to the Sugar Bounties Convention, viz:—that its effect will be to raise the price of sugar to the consumer.

We claim to speak with authority upon this subject, inasmuch as we represent the Home Industry connected with sugar refining, the sugar producing industry of the British colonies and other countries, also the engineering and other industries in the United Kingdom connected with the production, manufacture and distribution of sugar. Indeed, we practically represent the whole of the British Sugar Industry, in all its various departments both at home and abroad.

We are, therefore, thoroughly acquainted practically with the cost of producing and refining sugar, and we can unhesitatingly express our conviction, that the coming into force of the proposed Convention and the consequent abolition of bounties will not raise the price of sugar above its present level, nor will there be any restriction in the quantity of sugar imported into this country.

We have, &c.

The following is the list of names attached to the above letter:—

N. Lubbock, Chairman of the West India Committee and the
British and Colonial Anti-Bounty Association.

James Duncan, Chairman of the British Sugar Refiners' Committee.

Hogg, Curtis, Campbell & Co., Proprietors and Merchants, West
Indies and British Guiana.

Robert Kerr, Chairman, Scottish Sugar Refiners' Association.

Tom Neill, Honorary Secretary, Scottish Refiners' Association.

Abram Lyle & Sons, Sugar Refiners, London.

George Martineau, Honorary Secretary, British Sugar Refiners' Committee.

Thomas Daniel & Co., Limited, Edward Chambers, Director,
Proprietors and Merchants, West Indies and British Guiana.

The Rt. Hon. E. P. Bouverie, Chairman of the Colonial Company,
Limited.

Maclaine, Watson & Co., Merchants, London and Java.

Smith, Wood & Co., Merchants, London and Manila.

Arbuthnot, Latham & Co., Merchants, London.

C. Czarnikow, Sugar Broker, London.

- Thomas J. Johnston, Director of the St. Lucia Central Sugar Factory Company, Limited.
Jas. Child, Chairman of the Aerated Bread Company, London.
Sir Thomas Thornhill, Bart., Barbados.
C. Tennant, Sons, & Co., London and Trinidad.
Thomson, Hankey & Co., Merchants, London.
Daniel de Pass, Sugar Planter, Natal, South Africa.
C. Washington Eves, Sugar Planter, Jamaica.
E. D. & F. Man, Sugar and Colonial Brokers.
Cottam & Hill, Sugar and Colonial Brokers.
C. & C. J. Coles, Sugar and Colonial Brokers.
J. V. Drake & Co., 10 and 11, Mincing Lane; and Magdeburg, Sugar Merchants.
The Dennery Co., Limited; the St. Lucia Usines and Estates Co.; p. H. Hales, Manager, Sugar Producers, St. Lucia, W. I.
J. & E. Williams, Sugar Merchants and Brokers, Mincing Lane, London; and Magdeburg.
Carey & Browne, Produce Brokers, 36, Mincing Lane.
William Anderson & Co., 10, Mincing Lane, Sugar and Colonial Brokers.
Macdonald, Hutcheson & Co., London and Greenock, Sugar Brokers.
C. M. & C. Woodhouse, Sugar Brokers.
Livens & Bishop, 27, Mincing Lane, Sugar Brokers.
L. Cowan & Sons, Hammersmith Bridge Works, and 7, Mincing Lane, Sugar Refiners.
Ed. Kynaston, 10, Mincing Lane, Sugar Broker.
Bieber & Co., 4, Fenchurch Avenue, London; and Brazil, Merchants.
Mee, Billing & Co., 9, Great St. Helens, London; and Brazil, Merchants.
Raggio-Carneiro & Co., 129A, Winchester House, London; and Brazil, Merchants.
James Keiller & Sons, Manufacturing Confectioners, Marmalade and Preserve Makers, Dundee and London.
Erdmann & Sieleker, Merchants, London and Java.
Blyth, Greene, Jourdain & Co., London and Mauritius.
Sendall and Wade, Merchants and Proprietors, St. Kitts, W.I.
J. C. Shaw, Madras, East Indies.
Sir Daniel Cooper, Bart., G.C.M.G., for Australia, New Zealand and Fiji.
Young, Ehlers & Co., Merchants and Proprietors, London and Australia.
Boddington & Co., Merchants and Proprietors, West Indies and British Guiana.
D. Larnach, Banker and Proprietor, Australia.
Jno. McConnell & Co., British Guiana, Proprietors and Merchants, London and Liverpool.
For the Natal Central Sugar Company, Limited. D. Dors, Managing Director.
R. J. Jeffray for Queensland and Victoria.
James B. Alliot for Messrs. Manlove, Alliot & Co., Limited, Engineers and manufacturers.

Hermann Voss for the Anglo-Continental (late Ohlendorff's)
Guano Works, Limited.
Charles Parbury, Proprietor and Merchant, Australia.
F. Parbury & Co., Proprietors and Merchants, London and
Australia.
p.p. George Fletcher & Co., W. Parratt, Engineers and Manufac-
turers, London and Derby.
Sandbach, Tinne & Co., West India Planters and Merchants,
Liverpool.
Alex. Garnett & Co., West India Planters and Merchants,
Liverpool.
Sir T. Edwards Moss, Bart., West India Planter, Otterspool.
Bushby, Son & Beazley, Sugar Brokers, Liverpool.
Edward H. Harrison & Son, Produce Brokers, Liverpool.
Nichs. Waterhouse & Sons, do.
Fairrie, Astley & Co., do.
Brancker, Boxwell & Co., do.
Hampshire, Turner & Co., do.
A. Litherland Jones & Co., do.
Macfie & Sons, Sugar Refiners, Liverpool.
Henry Tate & Sons, do.
For Fairrie & Co., Limited, James Fairrie, Sugar Refiners, Liver-
pool.
James Leitch & Co., Sugar Refiners, Liverpool.
Jos. Heap & Sons, do.
For the Sankey Sugar Company, Edward C. Turner (partner),
Sugar Refiners, Liverpool.
G. Jager & Sons, Sugar Refiners, Liverpool.
Crosfield, Barrow & Co., do.
George Crosfield & Co., Sugar Merchants, Liverpool.
Anthony Jones & Co., do.
Edward P. Parry & Co., do.

To the foregoing letter the following reply has been received:—

Foreign Office, December 14th, 1888.

Sir,

I am directed by the Marquis of Salisbury to acknowledge the receipt of your letter of the 11th instant, forwarding a memorial with respect to the Convention of the 30th of August, 1888, for the suppression of sugar bounties, which has been signed by the representatives of the sugar producing industries of the British Colonies, as well as of the various industries connected with the production, manufacture, and distribution of sugar in the United Kingdom.

In reply, I am directed to request that you will be so good as to assure the gentlemen who have signed this memorial that it will receive the careful consideration of Her Majesty's Government.

I am, &c.,

(Signed) JAMES FERGUSSON.

N. LUBBOCK, Esq.,

Billiter House, E.C.

 REPLIES FROM MR. N. LUBBOCK AND MR. G. MARTINEAU
TO SIR THOMAS FARRER'S LAST LETTERS.*

The following replies to Sir Thomas H. Farrer were addressed to *The Times*, but have not been published :—

Billiter House, London, 19th November, 1888.

TO THE EDITOR OF "THE TIMES."

Sir,—The circumstance of a speech by Baron Henry De Worms on the subject of the Sugar Bounty Convention, has been taken advantage of by Sir Thomas Farrer to lay his well-known views once more before your readers.

There are one or two points in this last communication on which I would ask your permission to make a few remarks.

In the Baron's speech at Greenock he very naturally dwelt upon the great annual loss which the bounties inflict upon various interests in this country, and called attention to the evidence given by Mr. Tinne before the Royal Commission on the Depression of Trade. Mr. Tinne is a thoroughly competent witness, he has been for many years engaged in the sugar industry, and his knowledge of the whole subject is certainly not inferior to that possessed by Sir Thomas Farrer. Mr. Tinne, in his evidence, gave full details of how these annual losses were brought about, and, if he is mistaken in any of his statements and calculations, it was quite open to Sir Thomas Farrer to point out his error. But how does Sir Thomas meet this evidence, which naturally is so destructive of his theories in respect of bounties? "Such figures," says he, "and the inference from them, must be equally apocryphal. Without criticising or replying to such a statement I pass on, &c., &c."

Is this a serious way of meeting argument? Is it not rather an attempt to override inconvenient facts by an illegitimate display of assumed authority?

Sir Thomas Farrer has throughout his arguments consistently ignored the injury done to British interests by bounties, whilst at the same time he has largely exaggerated their effect upon the price of sugar. This exaggeration his last letter practically admits, since he now says: "My own opinion has hitherto been that the effect of the

* In December, 1888, *Sugar Cane*, page 642, we gave Sir Thomas Farrer's letter, dated November 6th, 1888.

“bounties is much exaggerated, and that neither their continuance nor their abolition would, in the face of more important factors, have the effect attributed to them by the anti-bounty agitators.”

What are the views Sir Thomas imagines to be those of the anti-bounty agitators, I have no means of knowing; and although I have read all his long letters on the subject, I have certainly failed to realize that in his opinion the abolition of bounties would not have much effect, but this tardy admission disposes of his argument that the consumer will suffer thereby.

But for the fear of taking up too much of your valuable space, I should like to have alluded to several incorrect statements in his letter. I may briefly point out, however, that so far from the French Government being indisposed to abolish bounties, as Sir Thomas states, they have distinctly expressed their readiness to do so. Again, the large sugar industry which he says is developing in the Western States of America is at present entirely imaginary. The total sugar production of the Western States is not even one-tenth of that of the little island of Barbados.

It seems strange that while Sir Thomas Farrer writes so voluminously upon the subject, he should take so little trouble to ascertain the facts of the case.

In conclusion, I wish to point out that, until Sir Thomas is prepared to assent to free-trade in sugar, he has no claim to consider himself a free-trader, and it is preposterous to pretend that those who are endeavouring to promote this free-trade are actuated by a belief in protection.

I am, Sir, your obedient servant,

N. LUBBOCK,

Chairman of the West India Committee.

TO THE EDITOR OF THE “TIMES.”

Sir,—Sir Thomas Farrer’s attack on Baron De Worms must necessarily be a one-sided affair, it being evident that the Baron is not likely to enter into a newspaper controversy. It is clear that Sir Thomas Farrer has not read the speech he criticises, but only a summary. If he had he would have found that most of his points were fully met, and his questions answered. The occasion has, however, given him the opportunity of marshalling once more the dry bones of an army which has been cut to pieces long since. He had

previously done his best to make your readers believe that the Convention is a protectionist measure, and that it will make sugar dearer, and we had shown, in reply, that it is a free trade measure which will have no appreciable effect on the price of sugar, while it will free the consumer from his present dangerous position of dependence on an artificially stimulated source of production. Nevertheless, Sir Thomas Farrer reproduces the old phrases about protection and dear sugar, just as if he had remained master of the situation, and his assertions had never been refuted.

In one place in the new letter Sir Thomas Farrer thinks that the abolition of bounties must cause a large rise in the price of sugar; in another he doubts whether bounties have had much to do with the cheapness of sugar. If this second view be correct, all his former energy in endeavouring to rescue the unfortunate consumer and jam maker from the danger of having bounties abolished was misdirected. If the other be the true opinion it is clear that bounties ought to have been abolished long ago, and before they had brought about such a dependence on an artificial industry that their removal involves scarcity and high prices.

In another place Sir Thomas Farrer says:—"My own opinion has hitherto been that the effect of bounties is much exaggerated, and that neither their continuance nor their abolition would, in the face of more important factors, have the effect attributed to them by the anti-bounty agitators." He surely means "by Sir Thomas Farrer." It is he only who has attributed effects of an exaggerated character to the continuance or abolition of bounties. We have confined ourselves to the modest statement that bounty-fed competition robs us of our legitimate profit, which may be represented by the small sum of 6d. per cwt., and has enabled foreign producers to be protected on British markets to the extent of 350,000 tons of foreign refined sugar per annum. As to the abolition of bounties, we have simply pointed out that it would restore free trade, and consequently benefit the consumer. The exaggerated statements to which Sir Thomas Farrer refers are entirely of his own invention; such, for instance, as that the abolition of bounties would deprive the jam and confectionery makers of the bounty-fed sugar on which they depend for their very existence. He now distinctly withdraws all that part of his case by saying:—"As at present advised I doubt whether bounties have had the effect attributed to them, whether they constitute the chief causes

of the recent cheapness of sugar." It is really time that Sir Thomas Farrer, if he writes many more letters, should inform his readers who these "anti-bounty agitators" are, to whom he so repeatedly refers, and what the exaggerated statements are which he ascribes to them. After the careful and complete refutation which we have given of the constantly reiterated assertions of Sir Thomas Farrer, it is almost trifling with the subject for him now calmly to ascribe them to "the anti-bounty agitators." But he goes on to deal with Baron de Worms' reply, that the abolition of bounties will not make sugar dearer, and accepts it as probably correct. "But then," he asks, "what becomes of the argument that it is the bounties which have made sugar cheap, and have thus, as is alleged, ruined our own sugar producers?" What, indeed? It is one entirely of Sir Thomas Farrer's creation, and he seems, at present, loath to part with it, though it has for some time been in a ragged state.

Having at last come definitely to the conclusion that the continuance of the bounties will not make sugar cheaper, and that their abolition will not make it dearer, which, if he had stated it earlier, would have saved us and your readers a deal of trouble, Sir Thomas Farrer wavers and is staggered by being told by Baron de Worms that the European bounties amount to about £9,000,000 a year. As the Board of Trade took the sugar question in hand some years ago, it is difficult to understand why Sir Thomas Farrer should be surprised at figures with which he ought to be familiar. He thinks they show that the abolition of bounties must cause a large rise in the price of sugar. If so, they also show what a terrible rod in pickle the consumer has laid up for himself by enjoying for so long the imaginary benefits of bounty-fed sugar, and how much the Board of Trade is to blame for resisting every effort to abolish bounties at a time when their abolition would have had a much less serious effect. A few years ago the consumer was only dependent on bounty-fed sources of supply to the extent of one-fifth of the world's visible production; now he is dependent on them to the extent of three-fifths of the world's supply. It is therefore clear that if the abolition of bounties is to raise prices—which it can only do by reducing production—it would do so much more violently now than it would have done a few years ago. As long as the bounties continue, the proportion of bounty-fed sugar to the total supply of the world will constantly increase, and consequently the longer we delay their abolition the greater will be the danger and ultimate injury to the consumer.

But Sir Thomas Farrer forgets that these bounties are enabling an inferior article, Beetroot, to compete with a superior article, sugar-cane. The "gigantic subsidy" which staggers him goes to make up the difference. Cane sugar has not been ruined, as Sir Thomas Farrer pretends. The industry can produce sugar at present prices, and continues to do so, but it cannot progress in the way it would have done if there had been free trade in sugar. Planters and manufacturers are not disposed to put fresh land into cultivation, erect new machinery, and launch out into all the latest improvements, so long as the present artificial state of things keeps matters in suspense and destroys all confidence in the future.

At the outset of his letter Sir Thomas Farrer recapitulates eleven points, which he says Baron de Worms has failed to meet, any one of which is, in his opinion, enough to destroy the Convention. I hope the readers of the *Times* will not accept all such statements as true because Sir Thomas Farrer declares them to be so. Nor can we be expected to deal with all such statements of opinion, the task would be endless. But when Sir Thomas Farrer peruses the speech he will find that Baron de Worms dealt with most of his eleven points and saved the Convention from immediate destruction. The large number of non-contracting powers is a pure assumption which has already been shown to be entirely unfounded. The alleged breach of commercial treaties is a matter which has been dealt with very fully, and it has been urged at the Conferences, as I pointed out before, that it is the bounties that are a breach of commercial treaties. Sir Thomas Farrer comes out now as a champion of Protection, for he actually complains that the provisions of the Convention prevent us from giving to our colonies the protection which the other countries give to theirs. This objection is, in Sir Thomas Farrer's opinion, enough to destroy the Convention, so he evidently thinks that the country is going to take a new departure in commercial policy, and condemns Baron de Worms for sticking by the good old principle of Free Trade. He conjures up a number of purely imaginary objections to the Commission for carrying out the provisions of the treaty. They are absolutely groundless, and yet he considers each one of them sufficient to destroy the Convention. The old question of certificates of origin was got rid of years ago, yet it now reappears as one of the fatal objections. There are, according to Sir Thomas Farrer, many other bounty-fed articles. We should be glad to know of them, as

they would be valuable allies, if only in assisting us to meet his frequent onslaughts. The Convention, it seems, is establishing a precedent which will naturally lead to retaliation upon foreign corn. This is one of the assertions which readers must not accept merely because Sir Thomas Farrer happens to believe it. We have already dealt fully with his use of the word retaliation and need not repeat the argument.

It appears that the one object which the authors of the Convention have in view is the protection of our sugar industries; and yet we have fully explained that the only object is the removal of protection to foreigners on British markets.

In joining issue with Baron de Worms on two points, Sir Thomas Farrer accepts his figures provisionally and only for the purpose of argument. But surely, figures are either right or wrong, and if wrong, any argument founded on them must be perfectly useless and mere waste of time. Sir Thomas Farrer does not deal with the correctness of the figures, but tries to throw discredit on them in this indirect way.

The first of the two points which are thus argued is disposed of by the assertion that "if we cut-off half the producing world from our market, we do not know how much sugar we may be excluding." Well, I should have thought we did know exactly. If we cut off half, surely we shall be excluding half. Although the idea is absurd, yet I am prepared to argue that even in that case we should still be buying sugar at the price ruling throughout the world, and that we should get as much sugar as we wanted. But I do not think that this ridiculous statement will mislead many of your readers. It is pretty well understood by this time that the penal clause is intended as a security to the contracting powers, that the necessity for enforcing it is not likely to arise, and that if it were enforced it would at once bring about the abolition of the offending bounty; and that even if it did not, it could not have any effect on the price of sugar throughout the world. The details of his argument are too far fetched to be worth answering. I should advise Sir Thomas Farrer to investigate more minutely the Brazilian guarantee, and the sugar industry of the United States, before constructing further fancy fluctuations in the supply of sugar, and evolving the alarming situation on which he supports his phantom argument. It would be well to know something of the rudiments of the subject before instructing the public through your valuable columns on the details of

an imaginary sugar trade. Sir Thomas Farrer is rapidly developing into a commercial Rider Haggard.

The second point on which a reply is given to Baron de Worms is the cheap sugar question, with which I have already dealt and which is now settled in my favour.

There remains only the peroration, in which Sir Thomas Farrer regrets that this country has not waited quietly until the bounties are abolished spontaneously, and gives as his reason the very fact which has brought about the present international arrangement. Germany and Austria wished to get rid of bounties, but unfortunately France, jealous of the success of the German and Austrian industries, started the same fiscal system, but on a very exaggerated scale. It became absolutely necessary to do something to check such a monster bounty, and consequently the other countries were not sorry to see Great Britain make a proposal for united action. How Sir Thomas Farrer can point to this situation as an argument for doing nothing it is difficult to understand.

Your readers will begin to ask why there should be all this volume of controversy. We have also wondered to the same effect. But still the nice long columns of nice large print, in Sir Thomas Farrer's pleasant readable style, continue to appear at regular intervals. What is it all about? Why this persistent assertion of that which has been shown to be erroneous? Why should the protection of foreigners on British markets be so constantly and vigorously defended by an undoubted free-trader?

The letter concludes with a handsome apology to Baron de Worms, thoroughly spoiled by the very gratuitous remark that his action can only be accounted for by the fact that he is a sincere and deep, even if unadmitted and unconscious, protectionist. It is necessary to bring that word in prominently, though Sir Thomas Farrer knows perfectly well that abolition of bounties is a restoration of free trade.

As Baron de Worms is unable to reply in your columns, I hope you will permit me to do so, and I urge my request on the further strong ground that Sir Thomas Farrer does not hesitate to repeat assertions without attempting to meet the arguments by which we have refuted them.

I am, Sir, your obedient servant,

(Signed,) GEORGE MARTINEAU.

21, Mincing Lane,

24th November, 1888.

TO THE EDITOR OF THE "TIMES."

Sir,—You say to-day, in reference to another matter, "great is the power of undaunted assertion." In the wielding of this power Sir Thomas Farrer has for years been an eminent expert, and he exercises it once more, I hope for the last time, in his reply* to the arguments I have ventured to put forward in refutation of his statements. He will not attempt, he says, to reply at length, as it would involve a repetition of former arguments. But how can a refutation be met by a repetition of the statements it professes to refute? I may, therefore, fairly assume that my arguments are unanswerable, except as regards the "one or two points" which Sir Thomas Farrer considers to require further notice. Let us see what they amount to.

Sir Thomas Farrer again urges the point that foreign protective duties interfere as much with the freedom of trade as bounties. I dealt fully with this point, but Sir Thomas refers to only a portion of my argument, and in doing so he is obliged to use, as his only rejoinder, the assertion that bounties do us more good than harm. As a great portion of my former letters was directed to show that this is an entirely erroneous assumption, and that, on the contrary, bounties are an injury to the consumer as well as to the producer, it is hardly fair fighting to decline to meet the arguments I adduced in refutation of the assertion, and then to repeat it as a rejoinder on another point.

My argument, if I recollect right, was that if we were to retaliate against foreign protective duties we should be attacking foreign Governments with regard to a matter in which they are entirely within their rights, namely, their own import duties. We should, moreover, be rushing into protection and injuring our consumers for a very problematical benefit. On the other hand, any course we may pursue for the abolition of bounties would be carried out without recourse to retaliation, it would be reasonable and desirable as a means of removing the most flagrant instance of protection which it is possible to imagine, namely, the protection of foreigners on British markets, and its only result would be the restoration of free trade by the removal of the bounty. This restoration of free trade is as necessary for the consumer as for the producer, since he would otherwise become more and more dependent every year on the artificial source of production.

The other point to which Sir Thomas Farrer returns affords me

the very best means of illustrating the false position into which the consumer is brought by the operation of bounties. He thinks I have not sufficiently answered his argument, that if the increase in the world's consumption is met by bounty-fed sugar, and we cut-off that supply, we must either reduce consumption or increase the price. My reply was to the effect that the operation of the Convention would be to abolish bounties, and that if Sir Thomas Farrer feared that one or two countries might still remain obstinate and continue to give bounties—a very improbable supposition—the annual available production of the world, five million tons, would be sufficient to keep up our supply at the world's price, whatever it might be. I admit that, when I stated that argument in reply to Sir Thomas Farrer, I did not by any means exhaust the subject. I did not, for instance, meet the supposition that a cutting-off of the bounty might involve a cutting-off of the supply of sugar which we now get from bounty-fed sources. That may be a supposition within the bounds of possibility, and if that is what is in the mind of Sir Thomas Farrer, it furnishes me with a most splendid illustration of the injury which is being inflicted on British consumers by foreign bounties. Of the five million tons which constitute the world's visible and available annual supply of sugar, more than half consists of beetroot sugar, nearly all of which is bounty-fed. If the abolition of the bounties means the "cutting-off" of this supply, the unfortunate consumer will, indeed, have to pay dearly for the privilege of eating bounty-fed sugar. If this is to be the result, would it not have been better for Sir Thomas Farrer and the Board of Trade to have permitted the abolition of bounties ten years ago, when the effect would have been less severe; or would it not be better to do so even now, rather than wait till beetroot sugar grows to still larger proportions, and the consumer runs the risk of a still more serious famine when things are at last righted, as they certainly will be some day? As I said before, I fear no such result from the abolition of bounties. They have, it is true, helped greatly in establishing a most important industry on the continent, but I fully believe that, when the bounties are abolished, that industry will enter heartily upon a free trade struggle with cane sugar. Our colonial producers are quite aware of this, and neither they nor ourselves shrink from the contest. We and our colonial friends have hitherto had to contend against beetroot plus bounties. Remove the bounties, and we are ready to hail the beet-

root in the same kindly spirit that we regard any fair and equal competition, from whatever part of the world it may come.

I am, of course, glad that Sir Thomas Farrer has not attempted any serious reply to my arguments. We may congratulate ourselves that two facts in connection with bounties are now fully established; they are no benefit to us whether we be consumers or producers, and their abolition is essentially a free trade measure.

It is to be hoped that the absurdly exaggerated misconceptions with regard to this matter, of which we have read so much during the last few weeks, will now give place to more rational views. The subject, from the consumer's point of view, is of much greater importance, and involves considerations which go much deeper down into the region of first principles than the general public are at present aware. It is also a colonial question of very great interest, and one not confined alone to our West Indian colonies. I hope, therefore, that it will continue to meet with proper attention from public men, quite apart from the sugar refiner's position, and I earnestly trust that it will be dealt with on its merits and not as merely furnishing clap trap for political speeches.

I am, Sir,

Your obedient servant,

(Signed), GEORGE MARTINEAU.

21, Mincing Lane,

October 30th, 1888.

FOREIGN OPINIONS UPON SUGAR AND SUGAR BOUNTIES.

The *Magdeburger Zeitung*, dealing with the assertion, which has lately been made in Germany, that the abolition of bounties means the eventual total ruin of the German beet sugar industry and the complete triumph of colonial sugar, gives some interesting figures. The writer calculates the amount of the bounty under the new legislation and with the certainly somewhat high yield of 13% sugar, at M. 2.34 per metric centner = 100 kilos. This gives in round numbers M. 1.20 or 1s. 2½d. per cwt. as the bounty now gained by Germany on export. He then proceeds to argue that such a figure is quite insignificant in face of the far higher variation in prices of 88% sugar in the London market. This variation he gives for the last six years as follows:—

•

	1883.		1884.		1885.		1886.		1887.		Up to Nov. 20, 1888.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Highest price ..	21	6	18	0	16	10½	15	9	16	3	16	3
Lowest price ..	17	9	9	10½	10	0	10	1½	10	6	12	6
Difference....	3	9	8	1½	6	10½	5	7½	5	9	3	9
<div style="text-align: center;"> s. d. </div>												
Highest price for six years ..	..	..	..	..	21	6						
Lowest do. do.	..	..	..	..	9	10½						
Difference ..	..	..	..	..	11	7½						

This hardly seems a satisfactory mode of dealing with figures. Surely the proper method would be to take into account the duration of the highest and lowest prices? Thus, for instance, the highest price this year only lasted a week, and cannot be regarded as a factor of any moment. The question of the relative importance of the amount of bounty would seem to depend on what is the *average* price which is obtained through at least one campaign or one year, if not a series of years.

The *Prager Zuckermarkt* considers that the question whether or not the general abolition of bounties (nothing less than universal abolition can be of any use) would be to the advantage of Austrian sugar manufacturers, is still an open one. One thing is certain; France, their most formidable competitor in the East, would in this case be paralysed, as it is only the excessive bounties obtained by French manufacturers which enable them to practically oust the Austrians in the Levant.

Mr. A. Horinek, the statistical editor of the *Prager Zuckermarkt*, estimates the world's production of sugar for 1888-89 as follows:—

BEET SUGAR, in thousands of tons.

Austria ..	525
Germany ..	970
France ..	486
Russia ..	467
Belgium ..	95
Holland ..	40
Denmark ..	22
Sweden ..	6
Roumania, Italy, and Spain ..	1

2,612

CANE SUGAR.

Barbadoes..	55
Brazil	235
Cuba	680
Demerara	90
Egypt	50
Guadeloupe	50
Hawai	100
Jamaica..	25.
Java	370
Louisiana	100
Martinique	40
Mauritius	125
Natal and Mayotte	12
East India	59
Peru	40
Philippines	170
Porto Rico	70
Réunion	35
St. Croix and the Lesser Antilles	45
Trinidad	55
	<u>2,397</u>

SUMMARY.

	1888-89.	1887-88.
Beet Sugar	2,612,000	2,315,000
Cane Sugar	<u>2,397,000</u>	<u>2,537,000</u>
Together	<u>5,009,000</u>	<u>4,852,000</u>

According to this table there is to be an excess of beet sugar for the current campaign of 300,000 tons, and a deficit of cane sugar of 140,000 tons, as compared with last campaign, the net excess of sugar produced being thus only 160,000 tons. In the above table the novelty is introduced of giving every country in detail instead of lumping (as heretofore) the smaller producing states under the term "other countries," the reason being that too much margin is allowed under this item. For instance Mr. Licht gives the figure of 67,000 tons under this head, while Mr. Horinek can only account for 30,000 tons. The period for production is reckoned in the case of beet sugar as August to July, and for cane sugar the exports from July to June are taken, as far as known.

THE SUGAR TRADE.

PARLIAMENTARY RETURN, No. 353.

Ordered to be printed, 10th August, 1888.

Besides the Imports into the United Kingdom of beet and cane sugar, raw and refined, and those into France, and the Exports therefrom, and the Imports into the United States, Canada, and Australia, and the Exports from the Mauritius, this return gives detailed particulars of the present out-put, compared with previous years, of our British sugar refineries.

The only refinery in Ireland is closed, and that at Plymouth has ceased work for some months, whether likely to be re-opened is unknown.

The following is a summary and comparison with 1880-81 and 1883-84, of the number of refineries at work and the out-put.

SUMMARY, AND COMPARISON WITH 1880-81 and 1883-84.

	1880-81.		1883-84.		1888.	
	Number of Refineries.	Output.	Number of Refineries.	Output.	Number of Refineries.	Output.
		Tons*		Tons.		Tons.
London. Hard Sugar....	3	55,000	3	60,000	5 at work.	200,000*
London. Soft Sugar	12	136,000	12	200,000		
TOTAL	12	191,000	12	260,000		
Liverpool. Hard and Soft.	12	205,000	10	250,000	10	258,000
Greenock ,,	10	241,000	9	237,000*	7	232,000†
Bristol ,,	2	30,000	2	36,000	2	33,000
Sundries ,,	3	33,000	3	33,000	2	15,000
TOTAL	39	700,000	36	816,000	26	739,000

* Mean of two estimates.

† This is less than the estimate, which is supplied from a different source, but corresponds to the actual out-turn in the first half of 1888.

Of the refineries at Bristol, its says :—

There are only two sugar refineries in Bristol, viz :—

1. The old Market Street Refinery, Bristol Sugar Refining Company (Limited), successors to Butterworth, Hill, and Stock, and W. S. Stock & Co., a small private limited company now, but at first and for a few years only an ordinary limited company, in £10 shares. Their turn-out is about 350 to 400 tons per week, and they employ about 150 hands.

2. The Castle Sugar Refining Company, Samuel Wills, Esq., J.P., sole partner now; until last year Wills and Young. Their make is from 250 to 280 tons per week, and they do not employ more than 80 or 90 men. This is one of the most economically worked refineries in the kingdom.

As merely all sugar is now sent out in bags there is almost no cooping, which formerly was a great expense and employed many hands; casks are, of course, still required for treacle.

The correspondent supplying the above information adds that both refineries in Bristol are believed to be doing well.

In the case of Greenock, the return gives the number of men in the refineries at 1720, and the estimated fixed capital at £850,000, and floating capital at £485,000, together £1,335,000.

All the Clyde refineries turn out soft crushed sugar, but in addition one firm turns out a proportion of hard grained crystals; two others a proportion of dry white granulated, similar to American granulated; and one a proportion of cubes.

The 1720 men employed are those working in the refineries only; in addition, the trade gives employment indirectly to an immense number of people in the form of quay labourers, samplers, weighers, carters, &c., &c.

In speaking of the changes which have taken place in the character of the sugars produced since 1883, the report says :—

“ A change of some interest has been taking place since 1883, in the gradual evidence that our United Kingdom refiners are anxious to meet the *varied* wants of consumers, by turning out not merely the old-fashioned ‘pieces’ (as soft sugar used to be called by the trade), but besides these and crystals (the *latter* a form of ‘hard’ sugar), granulated, cubes, castor sugar, imitation Demerara, and other quite *novel* makes of sugar have been, and are being, tried. For many years, in old times, loaf sugar and pieces were the sugars of general table use, combined (in London especially) with unrefined sugar of Demerara, Barbados, &c. Then, a dozen or more years ago, crystals

became popular. Later on America sent granulated, a small dry-grained sugar, and Australia did the same. Granulated became every year more liked, and cubes, made by patent processes, gradually destroyed or took the place of loaves. Loaves are almost out of fashion, or at least are becoming a less and less important form of sugar. Martineau makes a few, but *granulated* is the most progressive article, and looks as if it would be the almost universal *sugar of the future*. A good many refiners now have granulating machines and make it, more or less, every week. Some are beginning to turn out 'castor' sugar; it is understood that two or three in England, and three in Greenock are already making it in small quantities. Then packages are becoming modernised; unwieldy casks are being more and more replaced by 2-cwt. bags, an immense saving to the wholesale grocers who have to distribute to the many small retailers; there are also more frequently smaller casks, and cases of one, two, and three cwt., and altogether our refiners appear to be alive as they never were before, to the need for adapting their production to every possible taste. This is a marked and evident feature of our United Kingdom refining trade at the present time.

"These changes are not only new and interesting, but they explain the difficulty of now estimating separately the production of hard and soft sugar. It would not be easy to know under which head to classify, for it would need the employment of such headings as

- | | | |
|-------------|----------------|--------------------------------|
| 1. Loaf. | 4. Granulated. | 7. Castor. |
| 2. Cubes. | 5. Crystals. | 8. Imitation raw grocery sugar |
| 3. Tablets. | 6. Pieces. | and possibly other odd sorts. |

"The period seems a transition one, and refiners appear to be experimenting in these ways, hoping to hit the public taste, turning out first one and then another description, and generally so irregularly that *weight* of each sort is needless.

"Glucose or saccharum works seem developing over United Kingdom, adding, of course, both to use of sugar and the employment of labour; but these are perhaps not yet of sufficient importance to require detailed reference."

The report also gives a list of the leading wholesale manufacturers of jam and confectionery in London, with the number of hands employed therein, (6000,)—the quantity of sugar annually consumed is put down at 34,000 tons.

RAFFINOSE.

At a meeting of the Silesian Branch Association of Sugar Manufacturers, held last month, Dr. Herbertz, of Berlin, read a paper on the occurrence of raffinose in the beetroot, and in the various products of the manufacture of raw sugar. Much of his lecture was of interest only as regarded beetroot and molasses, but as the presence of raffinose, as has been lately clearly demonstrated, seriously affects the degree of polarisation of sugars, a short *resumé* of that part which relates to the history of this substance and its present scientific position may not be out of place.

In 1882 Loiseau announced the discovery in the products of sugar manufacture of a new kind of sugar, which he termed *raffinose*, but little notice was taken of it until it was observed that the pointed configuration of the crystals of certain sugars, and the over-polarisation of the residual products resulting from the strontian process were due to the presence of this substance. Of all the substances known to the Germans as *nicht-zucker*, i.e., non-sugar, raffinose is the most troublesome. It is regarded as non-sugar, though by its chemical constitution it belongs to the sugar group. It is almost tasteless, though it is believed to contribute strongly to the formation of molasses. Dr. Herzfeld thinks it is most correctly regarded as inactive, because, although a carbo-hydrate, it neither improves nor deteriorates the quality of sugars in which it is present.

But the most interesting peculiarity which it presents is its property of inverting polarised light more strongly than true sugar. One part of raffinose deflects the ray as strongly as 1.85 part of sugar, and thus the greatest misapprehension may exist as to the value for refining purposes of raw sugars containing raffinose. It is therefore of the highest importance to discover some means of banishing this substance from crystallised sugar, and confining it to the liquid products.

According to Dr. Herzfeld no new method of testing for raffinose has as yet been invented, nor have up to now any special means been discovered of separating or keeping it out of the raw sugar. He suggests that as raffinose requires 15% of water of crystallisation, it will be found that where the *masse-cuite* is comparatively deficient in water, less raffinose would pass over into the crystallised sugar than where there was an abundance of water.

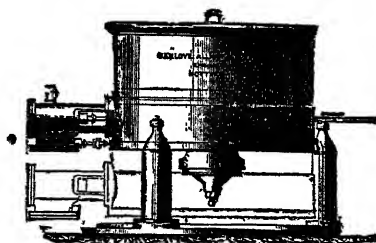
In testing for raffinose, the most important thing is a thoroughly reliable thermometer, which is somewhat difficult to obtain.

In the method of testing raw sugars which is at present practised in the German custom houses, raffinose is treated as *nicht-zucker*, or non-sugar.

Dr. Herzfeld seems to have been unable to give an opinion as to the presence of raffinose in colonial sugars, owing to the fact that the method employed for testing is inapplicable in this case, because they contain both invert sugar and active glucose. He intends to occupy himself further with the examination of this important substance.

PATENT RAISING GEAR FOR PENDULUM CENTRIFUGAL MACHINES.

An important improvement in centrifugal machines has recently been patented by Alliott & Haughton, and is manufactured by Messrs. Manlove, Alliott & Co., Limited, Nottingham, the well-known makers of this class of machinery. This improvement relates especially to that class of centrifugal which has an engine attached underneath the machine, and is suspended upon rods. It has been usual to construct a pit under such machines for the purpose of getting underneath them to examine the engine; and in cases where the floor has been constructed of fireproof material, or for other reasons it has been found impossible or inconvenient to make a pit to obtain access to the underside of the machine, it has been necessary to turn it over on its side for examination. Both these methods have been found to be inconvenient, and this improvement is designed to get over these difficulties. By a simple modification of the suspending arrangements, the machine can be rapidly lifted to a sufficient height to allow anyone to get underneath it to examine the working parts.



The engraving shews the machine raised up for this purpose, the dotted lines indicating the ordinary working position.

The following extract from the descriptive circular of the manufacturers describes the arrangements more fully :—

PATENT RAISING GEAR FOR PENDULUM HYDRO-EXTRACTOR.

The Pendulum Centrifugal Machine or Hydro-Extractor, suspended on rods, and with self-contained engine, has been adopted in very many places where it would have been difficult to employ any other type of machine. The fact that it requires practically no foundation, may be set down almost anywhere, even on upper floors, and requires only a steam pipe to connect to it, makes it an extremely convenient type in many instances.

It is evident that with a machine of this type the working parts of the engine are below the pan, and it has consequently been necessary always to make a small pit, or to cut a hole in the floor, to enable a workman to get below to conveniently examine the engine and moving parts. In a few cases where the floor has been constructed of fire-proof material, or where for other reasons it has been impossible or inconvenient to make a pit to obtain access to the under side of the machine, it has been necessary to turn it over on its side, at the expense of a considerable amount of trouble; the result being that the workmen of course do this as seldom as possible, and the engine is consequently run too long a period without examination, or adjustment.

To get over these difficulties the arrangement shewn in the woodcut has been devised and patented. It will be seen that the suspension rods are made with a screw thread along their whole length, and the vibrating joint in the foot of the pan forms a nut fitting the long screw. The upper end of the suspension rod or screw, has a square end which may be turned by a handle or spanner; by this means the machine can, at a moment's notice, be raised up about 18-ins. or a sufficient height to enable a man to comfortably examine the working parts. Only one spanner is usually supplied with the apparatus, but if required two more can be furnished, so that three men could work all the three screws simultaneously.

In the woodcut the dotted lines shew the machine in its working position, and the full lines shew it raised for examination.

The above device needs no further explanation. It is extremely simple, and will recommend itself to any intending purchaser who cannot conveniently obtain access to the under side of the machine in the ordinary way.

FILTRATION OF SUGAR SOLUTIONS IN SUGAR
REFINERIES, THROUGH FILTERPRESSES.

Patented to Mr. WILHELM BAUR, M.E., Brooklyn, N.Y.

Any sugar-liquor, which is mechanically filtered previous to its being filtered and decolorized in the ordinary bone black filters, will always have finely divided particles of impurities in suspension, as it is almost impossible to produce a perfectly clear and bright sugar solution with bag, sawdust, or brown-coal filtration.

This unclear liquor is sent to the bone-black filters. The coarse bone-black is by no means in every case capable of removing its cloudiness, and it has to be boiled up, not at all clear as it is, in the vacuum pan.

If, however, the bone-black does retain the fine suspended impurities, then this is only done in the upper layers of the filters. A practical method of removing and keeping these upper layers separated from the others does not exist; the contaminated bone-black, together with the comparatively clean lower layers in the filters, has to be washed and later on revived in the kilns. The bulk of the impurities is, even after most careful washing, retained in the pores of the bone-black, and the latter is for this reason injuriously calcinated in the kilns.

This spoils the bone-black to a high degree for the main purpose for which it shall be used, viz.: it loses a great part of its decolorizing power. Every sugar refiner is well familiar with these fundamental principles, as the length of time during which the bone-black can be used for decolorization, as well as the efficiency of the same, stand in direct proportion to the degree of perfection to which the previous mechanical filtration had been carried out.

Besides, it is known that the purity of the sugar-liquor, while the latter passes through those upper layers, is badly affected, as the liquor is thereby considerably saturated with lime and other salts.

Practical experiments have shown that the above mentioned upper layers have a maximum thickness of about three inches.

Mr. Baur has brought to perfection the idea of furnishing an intermediate filter, corresponding with the mechanical filter formed by the upper layers of bone-black in the bone-black filters. He constructed a filterpress, the blank frames of which are three inches thick, and can be filled with bone-black through an opening on top. Through this bone-black the liquor is filtered. One blank frame always being

placed between two filterplates, the liquor enters from the one and runs off, after being past through the frame, through the plate at the other side of the frame. The filterplates at the inlet side are covered with coarse "burlap" or wire-cloth; at the other side, where the filtered liquor runs off, fine cotton-cloth is used.

The filterpress itself, with its air-screws for removing the air from the inside of the plates, its inlet channels for liquor and water in projections at the lower and opposite upper corners of plates and frames respectively, which are tightened by means of India rubber gaskets, and its swinging screw for an easy opening and closing of the press, is the same which is specially used in sugar-houses and known under the name, "Kroog's Patent Filterpress."

The grain of the bone-black is chosen fine enough to remove even the slightest cloudiness in the liquor, which is passing through the same at a certain speed. This fine bone-black has an other advantage besides; it has a very great absorbing power for salts, on account of its excellent distribution and large surface; its decolorizing power is also increased as compared with that of coarse bone-black, especially if the bone-black employed is of good quality. If necessary it can be subjected to a revivification by fermentation, washing and heating to redness, separate from the other bone-black, as it represents only a very small percentage on the total quantity of bone-black to be revivified.

Up to this date no practical and useful method of utilizing this fine bone-black as a filtering medium was known, the bone-black stock was simply sifted, and the fine material sold to fertilizer works; no use was therefore made either of its mechanical filtering capacity nor of its absorbing and decolorizing properties.

The enormous advantages gained by a perfect mechanical filtration and by saving of the bone-black stock, are therefore gained by utilizing a material which costs nothing, as the fine bone-black after being used over and over in the "Baur Filterpresses" does not loose anything of its value as a fertilizer.

Advantages of Baur's process of filtration: 1, Economy; 2, Saving in bone-black; 3, Clear and at all times uniform result; 4, Reduced amount of sweet water; 5, Saving in inversion.

Our "Baur Filterpresses" are designed for a working pressure of 90 lbs. per square inch.

Sangerhäuser Actien-Maschinenfabrik & Eisengiesserei (vormals Hornung & Rabe), are sole makers of "Baur's Patent Filterpress."

THE ELECTRIC SUGAR REFINING COMPANY.

The following is from the New York correspondent of the *Financial News*, under date December 3rd, 1888:—

I have witnessed to-day the first thorough test, with completed plant, of the electric sugar-refining process. It was made at the Electric Sugar Company's works, which are located in Hamilton Avenue, Brooklyn. The building is five stories high. The top floor is used for receiving raw sugar and discharging it into a chute. The two floors beneath are occupied by the refining process, and nobody is admitted here except those possessing the secret. The sugar is discharged on to the floor below through nine different chutes, each chute delivering a different grade as to size and quality. The two tests previously reported were made with partial plant. The result of to-day's run was 50 barrels of perfectly snow-white crystallised sugar of the highest quality, all made in 128 minutes. There were several stoppages incident to newness of machinery, &c. While the machinery was running one barrel of sugar was turned out every $2\frac{1}{2}$ minutes, nine streams running at once. There was no preparation for boiling sugar, nor bone black filtering, and no smell such as is inseparable from the old methods. Old refiners present conceded that the granulation was entirely different from that of common refined sugar.

Mr. H. C. Highet, formerly of Liverpool and now of New York, and Mr. Willett, of New York, expressed great satisfaction at the result. Only three men and one woman were engaged in the refining room, while in the granulating department, on the floor below the refining room, there were two men and one woman, making only seven altogether who were connected with the operation of refining. Mr. Willett says that at the rate of to-day's run it would take 50 men two days by the old process to accomplish the same result. Very early next year it will be possible for the company to start refining about 2,000 barrels per day for the market, and when the factory is in full operation it will be able to turn out about 4,000 barrels per day of 24 hours. The reason why the operation will not be commenced before early next year is connected with the securing of patents.

CENTRAL SUGAR FACTORIES IN BRAZIL.

An enormous amount of capital has been invested in Brazil by people in this country, in the establishment of Central Sugar Factories, which has been in many cases either lost, or, from various causes rendered at present unremunerative.

When these central factories were first started, sugars of the Demerara type were selling at 30s. per cwt., and contracts extending over a number of years were entered into with planters for their canes.

With sugars down to about one half of the then price, it will be easily seen that it was quite hopeless to continue working upon the contract price for the cane, and as the planters declined to modify their contracts, the consequence was that the factories were stopped.

The factories of THE BAHIA CENTRAL SUGAR COMPANY, LIMITED, which had just been finished were in this position. Everyone felt dissatisfied; the management became reckless; planters disheartened; everything and everybody demoralised.

At the commencement of 1887, the Board in London was re-constructed, and able practical men elected, and an experienced manager, the best that Demerara could produce, was sent out.

A fresh agreement upon a firm basis was entered into, between the planters and factories. Great economy was exercised, and grinding began again in October, at both Rio Fundo and Iguape. At the former, a good quantity of sugar and rum was made; the planters sending in their cane regularly, and the factory working with an economy not previously dreamt of; the result has been that under this new management, a considerable profit.

At Iguape, the planters were unable to supply the stipulated quantity of cane, owing, it is said, to the slaves having obtained their freedom, not settling down to work, and no other arrangements having been made to meet this contingency. The factory, however, was started and proved itself equal to all that was stipulated; the government guarantee of 6 per cent. on the capital expended, has not been renewed since the crisis before mentioned.

The manager Mr. John Turner is now in Rio de Janeiro, with a requisition signed by the governor and all the leading planters and merchants in the neighbourhood, and in Bahia, for a restoration of their guarantee or concession as it is called, and if the government will consult

the interest of its planters they will at once accede to this, and place the investments in the great factories upon a sure and paying basis.

The Governor of the Province and his officials have lately made an inspection of the works, and their report published in the *Journal de Noticias*, of 8th October, 1888, we append to this.

The other two factories, Conde and Cotegipe, of this company, are only partially erected, but should the two previously alluded to earn a fair average profit this season, and the guarantee be renewed, they will in all probability be finished and set to work.

REPORT ON THE VISIT OF THE GOVERNOR OF THE PROVINCE OF BAHIA TO THE CENTRAL SUGAR FACTORIES.

We have lately visited the large central sugar factory of Iguape and a portion of the somewhat picturesque town.

The mill is one of the best of its kind. It is of the three cylinder type, each 40 inches in diameter, and having 76 inches of crushing surface, driven by a horizontal engine of 200-horse power, with a hydraulic arrangement, exerting a pressure on the drums of 1,527 kilos. per square inch, and extracting from the cane 72% of the juice.

The bagasse issuing from the mill is carried by an endless band direct to the seven multitubular boilers, six of which are sufficient, with the help of a very small quantity of wood, to drive the entire works. Coal is not used.

The juice is forced by a special engine with two pumps, on the diagonal system, in the direction of a series of six clarifiers, each having a capacity of 5,902 litres, and fitted with a steam-heated worm.

From the clarifiers the juice descends into the *monte-jus*, which discharges it through 12 filter-presses. From the presses it passes into the receivers below, and is there drawn by the vacuum into the triple effect; thence it goes to the filtering boxes (constructed on a system which is much in favour here), and afterwards into the vacuum pans.

The triple effect is of the largest size, and is capable of concentrating 13,260 litres of juice per hour with a density of 8° to 25° Beaumé.

There are two vacuum pans, holding respectively 10,000 and 8,000 kilos., and capable of striking two to three times per day, and worked with steam of 8 lbs. to the square inch.

The vacuum for the triple effect and vacuum pans, is created by the large displacement vacuum pump, which actuate the two pans and the triple effect, giving a vacuum varying from 25·5° to 27 square inches, according to the boiling of the sugar. The vacuum pump is connected with a cold water pump, capable of lifting 317,800 litres per hour from the ponds. From the vacuum pans, the sugar goes to the receiver or pug mill, and to the centrifugals.

From the centrifugals, it is taken to the steam elevator, which carries it to the warehouse, where it is put into bags, ready to be transported to Bahia.

Adjoining the factory is the distillery, with a division for the fermentation, and another, furnished with a continuous still, which can turn out 545 litres per hour of 24° to 25° of the Cartier hydrometer.

The factory is able to work up 400 tons of cane per diem.

The canes are transported by sea and by land, there being four locomotives, several steam barges, and 130 waggons, for the transport service in question.

The whole of the machinery has been supplied by Messrs. Duncan Stewart & Co., of Glasgow.

Experts affirm that as regards machinery for the manufacture of sugar, there seems to be none in the empire superior to that of the central factory at Iguape.

The superintendent of these works and also of that of Rio Fundo is Mr. J. Turner, and the manager, Mr. Thomas Daly, both of whom we have to thank for the attention shown us and the information given above.

We regret, however, the sort of paralysation which characterises the plantation of the cane in the district surrounding the central factory at Iguape.

Without labourers, without assistance, the planters give themselves up to a certain despair, and it is necessary that they should seriously endeavour to fight against this.

For the daily crushing of the central works, 400 tons of cane are necessary. This quantity appears at long intervals, sometimes only 300 tons and less are delivered. This is a fact worthy of being studied.

The Central Factories' Company, which was at first placed under bad management, is now disposed and determined to lend every assistance to the planters.

The Government, putting out of the question certain undesirable points (and this is not the place to discuss them), would, by again making valid the guarantee of interest, give a fresh impetus to the labours of the central factories and the company, thus supported, would discharge its liabilities to the planters.

Let the public authorities meditate well on this. Mutual assistance is urgently incumbent on our planters, who are passing through a threatening crisis.

MONTHLY LIST OF PATENTS.

Communicated by Mr. W. P. THOMPSON, C.E., F.C.S., M.I.M.E.,
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ENGLISH.

APPLICATIONS.

16669. F. WEIDENECHT and C. SCHOEELLER, London. *Improvements in crushing or pulverizing machines.* 16th November, 1888.

16703. C. STEFFEN, London. *Improvements in lixiviating batteries for raw sugar or sugar mass.* (Complete specification.) 17th November, 1888.

17031. S. H. JOHNSON and C. C. HUTCHINSON, Stratford, Essex. *Improvements in filter presses.* 23rd November, 1888.

17339. A. BAUMGARTH, London. *Improvements in refining sugar and apparatus therefor.* 28th November, 1888.

18177. H. R. GREGORY and G. MACDONALD, London. *Improvements in the manufacture of filtering material applicable to the filtration and purification of water, sewage effluents, saccharine juices, alcoholic liquors, and other liquids and fluids.* 12th December, 1888.

ABRIDGEMENT.

1752. ALFRED CHAPMAN, of Messrs. Fawcett, Preston, & Co., of 17, York Street, Liverpool. *Improvements in apparatus for evaporating saccharine or other solutions or liquids.* February 6th, 1888. In evaporating apparatus, as sometimes constructed, there is a pan, having a steam chamber, through which chamber vertical pipes are laid. The liquor enters the lower part of the vessel, passes up some of the pipes, descends again through others into the lower chamber, and thence leaves the pan. There is a tendency in this form of apparatus for some of the liquor to pass through the pan without

traversing the tubes, and it is to obviate this fault and to secure good circulation, that the present pan was designed. In this pan the liquor does not return into the lower chamber at all, but after rising through the tubes, it flows downwards through a special tube or tubes, which lead out of the apparatus or into the next pan of the series. Division plates are sometimes used, and suitable control valves may be added.

AMERICAN.

ABRIDGMENTS.

392583. OTTO BRAUN, of Berlin, Germany. *Centrifugal machine*. 11th May, 1888. This machine is designed with the object of allowing the cage to oscillate in such a manner that the centre of gravity of it and its contents may be in the same vertical plane as the axis of rotation. A universal joint is provided, composed of concentric rings and trunnions, by means of which the cage is attached to the vertical driving shaft. This shaft is made in two portions, connected together by a buffered joint, so that the upper cage carrying part can oscillate if required, while the lower one, which carries the power driven pulley, is rigid. A long endless driving band is used, which takes several turns round the pulleys, and an adjusting device is provided to maintain the required tension.

392864. DAVID JONES, of Paris, Tennessee. *Evaporating pan*. 30th June, 1888. Consists of a heating pan combined with an evaporating pan, so that the substance under treatment may flow from the former into the latter. The pan is provided with hollow, partial, division plates. These plates, as well as the two pans, are heated with steam. A skimming device, and an arrangement of eccentrics for rocking the pan are provided; also suitable feed and withdrawal arrangements.

393196. GEORGE E. WHEELER, of Chazy, Clinton, New York. *Cover for evaporating pans*. November 20th, 1888. This invention relates to covers for evaporating pans, for use in the evaporation of fluids. The main objects of the improvements are simplicity and cheapness of construction, and convenience and efficiency in use. The cover is adapted for use with any ordinary evaporating pan having an open top, and is constructed to fit upon the top of the particular form of pan employed. It is preferred to make the cover with a longitudinal ridge, and sloping hinged sides or lids ("roof-shaped"). These sides or lids are preferably made double, and contain dead air spaces. A series of transverse diaphragms descends from the under side of the

cover a short way under the surface of the liquor, thus dividing it, more or less, into lots. From each of the compartments thus formed a draught tube extends vertically, said tubes being supported by the longitudinal ridge. The cover, and pipes, &c., &c., are coated with paper or other non-conducting material.

393699. W. S. GILMORE, of Chester, O., U.S.A. *Evaporator*. November 27th, 1888. This is an appliance chiefly for use in the evaporation of maple sap into syrup. Three flat pans are shown supported directly above a furnace. The syrup is heated in the first pan, passes through a pipe provided with a cock into the second pan, and thence through similar connections to the third, whence it is withdrawn when ready. The above-mentioned pipe connections form hinges upon which the pan or pans may be tilted to facilitate the flow of juice. Division plates with or without adjustable openings are used, if desired, preferable one in each pan.

BELGIAN.

ABRIDGMENTS.

70397. E. VAN HAESSENDONCK, Brussels, patent of addition to main patent of the 2nd of May, 1883. *Improvements in apparatus used for the simplification and refining of raw sugar*. October 5th, 1885. This apparatus consists of a hollow cylinder, the length of which is in proportion to the work it is wished to effect, and on which knives are fixed at intervals, in such a manner that only a few ingots are cut at once, and according to the force of the rotation produced by a belt on the pulley. These knives must be fixed on the cylinder, the distance between them being equal to the thickness of the pieces to be obtained.

70451. C. W. GUY, Saint Josse-ten-Noode. *Improvements in cane crushing mills*. October 10th, 1885. 1. The inventor claims in a main crushing mill the combination of three horizontal cylinders, arranged in such a manner that one revolves in contact or almost in contact with the other two, the lines of contact or approximate contact being within the limit of an angle of 90 degrees, formed by the vertical and horizontal lines passing through the centre of the first cylinder. 2. In a main mill for crushing sugar cane, the combination of three horizontal cylinders arranged in such a manner that one revolves in contact or almost in contact with the other two, the lines of contact or of approximate contact being within the limits of an angle of 90 degrees, formed by the vertical and horizontal lines passing through the centre of the first cylinder with caps or covers,

foundation bolts, and an elastic substance or device placed between the said caps.

70514. T. A. KAULEK, Brussels. *Improvements in a press proof stick, by means of which the density of beetroot syrup can be readily ascertained.* 15th October, 1885. The press proof stick forming the object of this invention is intended to give rapidly the density of the syrup or juice extracted from beetroot and other tubercules, or from fruits. It is characterised: 1. By the union in one single tool of a proof stick and press for the extraction of juices. 2. By the application of an endless screw, actuated by a helical wheel, for working the proof stick. 3. By the double arrangement given to the proof stick for the purpose of obtaining a greater number of operations in the same time, and more voluminous samples.

70516. J. PURVEZ, Brussels. *Improved process of filtration of the juices extracted from beetroot, sugar cane, &c.* 16th October, 1885. (Patent of addition to patent dated August 25th, 1885.) The inventor claims the following principles as improvements on the principal patent:—1. The washing of the filtering surfaces in the body of the filters used for filtering juices, syrups, or other liquids, by means of an injection of hot water under an underterminate pressure, without it being necessary to open the apparatus. 2. The possibility of bringing back through a channel formed in the slit of one of the sides of the trays the filtered juices, from the top to the bottom of the apparatus, so that they leave the latter at the bottom, and maintain at the same time an upward circulation in the apparatus. 3. The application of the apparatus as double-acting filter press, acting also by displacement, with formation of the cakes on a metallic filtering surface, and filtration of the comparatively clear juices obtained through the first operation on ordinary metallic filtering surfaces.

70538. SELWIG and LANGE, Brussels. *Improvements in the manufacture of sugar blocks of regular shape in centrifugals.* October 17th, 1885. The invention has for its object a process of manufacturing blocks of sugar of regular shape with internal surfaces, which are perfectly plane and smooth in centrifugals, said process consisting in applying loosely against the internal surface of the sugar to be decoloured a plate more or less heavy, previous to steam, and which the centrifugal force presses, during the working of the centrifugal, against the mass of the sugar, the density of the latter being thereby increased.

70652. MARIOLE PINGUET, St. Gilles. *Improvements in apparatus for the mechanical and successive filtration of juices and syrups.* October 29th, 1885. The inventor claims as his property the system of mechanical and successive filtration forming only one apparatus, whatever the number of successive filtrations may be, the number of frames for each series and the mode of circulation of the liquids in the frames, the internal lining of the exit frames by wooden or metal screens preventing the cloths coming near each other, whether these stays form a mass filling up completely the thickness of the outlet frame, or are formed by metal plates or fabrics placed parallel between them and on the faces of the frames.

70756. T. C. GLASER, St. Josse-ten-Noode. *Invention for a crystallizer, intended for the manufacture of sugar-candy.* November 6th, 1885. The invention consists of an apparatus for crystallizing sugar-candy. This apparatus is of prismatical shape and of any cross section (circular, curved, polygonal). It is provided with a removable bottom and a manhole, as well as with strings stretched in a vertical direction between the lid and the bottom.

70771. L. WALKHOFF, Brussels. *Invention for a pocket filter for sweet juices etcetera.* 7th November, 1885. The inventor claims:—A system of pocket filters, characterised essentially by the fact that the bags forming the filtering pockets are in a water-tight chamber, and are suspended by their closed ends to the top of the said chamber, and secured at their open ends to the edges of openings, establishing a communication between the bottom of the said chamber and a lower chamber in which the liquids to be filtered are supplied under pressure.

71153. J. DUNCAN and E. R. NEWLANDS, Brussels. *Invention for the manufacture and treatment of sugars and apparatus employed therein.* December 8th, 1885. This invention relates to improvements in the manufacture of sugar and has for its object the production of sugar in sticks in a more economical manner than it has hitherto been obtained. In carrying out their invention the inventors use a mould, the body of which is formed by two end pieces of indented or indulated section, and by two lateral smooth plates. In the body of the mould is fitted a series of indented or undulated plates which form with the undulated extremities and lateral plates of the mould, a series of elongated spaces of square section, so that the sugar is obtained in the shape of square sticks which have only to be cut before they are consumed.

71264. C. UHL and Co., Saint Josse-ten-Noode. *Improvements in the separation of sugar from saccharine fluids.* December 17th, 1885. The inventors claim the process of precipitating or separating sugar from saccharine fluids (such as juices of plants, molasses, syrups, the impoverished liquors obtained in the extraction of sugar from molasses etcetera) in the shape of a saccharate of lime by the addition of ammoniac in the gaseous form, or in that of aqueous solution (or of potash or caustic soda) to a saccharine liquid previously saturated thoroughly with lime.

71285. C. STEVENARD, Brussels. *Improvements in a sugar moulding machine.* Dated 18th December, 1885. Patent of addition to patent of the 8th December, 1881. The improvement consists essentially in—1. The simultaneous cleavage and kneading of pure sugar in the granular form with cleare for the purpose of decreasing the dimensions of the sugar crystals, and moistening them sufficiently to allow of their being moulded in pieces intended for immediate consumption. 2. The delivery of these pieces of sugar moulded on frames, which can be superposed in a carriage provided with compartments and movable on rails, so as to be wheeled into a stove.

71687. M. HECHT and L. HOFFMANN, Saint-Josse-ten-Noode. *Improvements in the manufacture of loaf and other sugar.* January 19th, 1886. The inventors claim: 1. The arrangement of the centrifugal turbine drum in such manner as to allow the cleare which is in a reservoir inside and concentric with the said drum to be introduced into the latter while the turbine is in motion or at rest, through branches of pipes fitting and attached to the crystallizing boxes with the object of purifying blocks, squares, or bars of sugar and boiling masses connected with sugar refining. 2. The arrangement of the crystallizer or filter or even of projections from the partitions of the turbine drum in such manner as to keep the boiling mass at a certain distance from the perforated sides of the polygonal centrifugal drum, so that the said mass while moving in the box will leave a space between it and the bottom of the box for the reception of the cleare.

Patentees of Inventions connected with the production, manufacture, and refining of sugar will find *The Sugar Cane* the best medium for their advertisements.

The Sugar Cane has a wide circulation among planters in all sugar producing countries, as well as among refiners, merchants, commission agents, and brokers, interested in the trade, at home and abroad.

ESTIMATE OF THE PRINCIPAL CANE SUGAR CROPS.

	1888-89.	1887-88.	1886-87.	1885-86.	1884-85.	1883-84.	1882-83.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Cuba	650,000	647,000	608,900	705,400	630,800	560,900	485,000
Porto Rico	70,000	75,000	86,000	64,000	70,000	98,600	70,000
Trinidad	65,000	60,000	69,000	49,200	65,700	59,800	54,000
Barbados	65,000	60,000	65,000	44,000	60,700	56,000	52,000
Jamaica	30,000	30,000	21,000	17,000	25,000	29,500	25,000
Antigua and St. Kitt's	25,000	26,000	25,000	25,000	20,000	23,000	16,000
Martinique	45,000	42,000	41,000	33,000	38,800	49,400	46,800
Guadeloupe	55,000	50,000	55,000	37,000	41,200	53,300	52,000
Demerara	130,000	125,000	135,000	111,800	96,000	126,000	117,000
Reunion	32,000	32,000	32,000	35,000	36,500	37,800	34,000
Mauritius	130,000	120,000	101,800	114,200	128,000	120,400	116,700
Java	305,000	380,000	363,950	355,950	374,400	311,400	283,600
British India	55,000	55,000	50,000	50,000	45,000	60,000	87,000
Brazils	220,000	320,000	260,000	185,000	269,000	359,000	218,000
Manila, Cebu, and Iloilo	230,000	170,000	180,000	185,000	203,400	122,000	211,600
Louisiana	120,000	158,000	80,900	127,900	94,500	128,400	135,300
Peru	30,000	30,000	26,000	27,000	35,000	25,000	31,000
Egypt	50,000	50,000	50,000	65,000	41,000	37,000	21,000
Sandwich Islands	125,000	100,000	95,000	96,500	76,500	63,700	51,000
Total of Cane	2,432,000	2,530,000	2,345,550	2,339,950	2,351,500	2,323,200	2,107,000
Beet	2,825,000	2,400,000	2,728,800	2,216,600	2,546,000	2,361,000	2,147,000
Cane and Beet	5,257,000	4,930,000	5,074,350	4,556,550	4,897,500	4,684,200	4,254,000

From H. Clark & Co.'s Monthly Report, December, 1888.

IMPORTS AND EXPORTS (UNITED KINGDOM) OF RAW AND REFINED SUGARS.*

JANUARY 1ST TO NOVEMBER 30TH, 1887-1888.

Board of Trade Returns.

IMPORTS.

RAW SUGARS.	QUANTITIES.		VALUE.	
	1887.	1888.	1887.	1888.
	Cwts.	Cwts.	£	£
Germany	6,594,274	4,468,528	3,761,799	2,913,198
Holland	348,613	259,707	188,866	166,924
Belgium	824,169	584,750	464,108	371,381
France	60,231	23,802	35,555	17,357
British West Indies & Guiana	1,991,241	2,017,144	1,408,465	1,614,579
British East Indies	646,062	993,937	301,877	477,585
China and Hong Kong	312	10,733	201	6,420
Mauritius	104,404	255,263	57,153	172,422
Spanish West India Islands	174,758	304,496	108,130	223,544
Brazil	783,638	2,163,085	423,275	1,361,411
Java	3,013,065	3,496,659	1,938,299	2,607,342
Philippine Islands	398,786	706,425	180,398	337,604
Peru	389,054	456,065	240,506	338,569
Other Countries	517,789	648,069	292,780	473,141
Total of Raw Sugars ..	15,846,396	16,388,663	9,398,415	11,081,477
Molasses	285,154	336,448	94,119	105,847
Total Sugar and Molasses	....	....	9,492,534	11,187,324
REFINED SUGARS.				
	Cwts.	Cwts.	£	£
Germany	2,359,938	2,595,744	1,801,085	2,264,583
Holland	1,346,189	1,284,975	1,044,597	1,163,386
Belgium	194,749	176,295	161,267	168,015
France	1,439,484	1,197,337	1,090,245	1,058,348
United States	777,333	40,498	623,249	37,920
Other Countries	108,012*	397,412*	77,508*	316,298*
Total of Refined	6,225,705	5,692,261	4,797,951	5,008,550

EXPORTS.—REFINED SUGARS.

	Cwts.	Cwts.	£	£
Sweden and Norway	69,163	69,612	49,191	57,628
Denmark	108,263	96,634	62,671	71,060
Holland	72,279	84,289	48,610	61,014
Belgium	36,907	29,297	22,570	19,932
France	29,684	6,982	18,576	4,888
Portugal, Azores, & Madeira	72,267	74,845	43,065	53,502
Italy	97,078	84,012	63,705	62,130
Other Countries	172,720	119,644	120,606	147,662
Total of Refined	658,361	635,315	428,994	477,810

* Entirely from Russia.

IMPORTS OF FOREIGN REFINED SUGAR.

The British Sugar Refiners' Committee furnish us with the following figures, giving the imports of foreign refined sugar for the month of November, 1888, compared with the corresponding month of the two preceding years, and the average monthly imports for the year compared with those of 1885, 1886, and 1887, distinguishing the quantities of "Lumps and Loaves" from "other sorts," and giving the separate imports from each country:—

Countries from which Sugar has been imported.	" LUMPS AND LOAVES."				" OTHER SORTS," Including Crushed Loaf, Granulated, Crystallized, &c.				TOTAL.													
	Monthly Average.		Nov.	Nov.	Monthly Average.		Nov.	Nov.	Monthly Average.		Nov.	Nov.										
	1885	1886	1887	1888	1885	1886	1887	1888	1885	1886	1887	1888										
France.....	1587	1462	1363	1876	1709	1087	2121	403	2688	5099	3765	12693	11707	17543	Tons.	Tons.	Tons.	Tons.				
Holland	3848	3508	3780	3206	4058	3590	3224	1472	1428	2453	2634	1463	3829	2986	2060	4150	6462	5441	14271	12704	19664	
Germany & Austria ..	808	990	1847	1350	1246	1315	1922	3282	6634	10463	10449	8082	13224	11952	5320	4036	6263	5840	5521	7219	6210	13874
Belgium	189	314	592	587	268	896	507	120	113	308	214	87	370	123	309	457	900	801	355	1266	630	1266
United States	707	864	454	9	1403	..	..	8869	5078	2804	166	6920	11	7	9576	5932	3258	175	8923	11	7	7
Prussia .....	..	..	3	..	..	..	..	875	3112	452	1804	..	349	292	875	3112	455	1804	..	349	292	292
Other Countries	1	..	..	1	..	..	..	24	9	15	2	..	..	10	25	9	15	3	..	..	10	10
Total	7160	7158	7536	6628	8684	6688	7774	15085	19302	21624	19034	29064	29280	32313	22235	26520	29163	25963	37748	36178	40687	40687

SUGAR STATISTICS—GREAT BRITAIN.

FOR THE FOUR PRINCIPAL PORTS.

TO DECEMBER 22ND, 1888 AND 1887. IN THOUSANDS OF TONS, TO
THE NEAREST THOUSAND.

	STOCKS.		DELIVERIES.		IMPORTS.	
	1888.	1887.	1888.	1887.	1888.	1887.
London	30	.. 50	303	.. 314	280	.. 288
Liverpool ..	95	.. 85	318	.. 269	329	.. 277
Bristol	5	.. 3	51	.. 58	51	.. 57
Clyde	23	.. 44	246	.. 234	227	.. 243
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
Total ..	153	182	918	875	887	865
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
	Decrease.. 29		Increase.. 43		Increase.. 22	

The above figures do not include Hull, Leith, &c., of which there are no published returns.

MR. GÖRZ'S ESTIMATE OF THE EUROPEAN BEET CROP
FOR 1888-89, AND THE ACTUAL CROPS OF THE
THREE PREVIOUS YEARS.

	Estimate.			
	1888-89. Tons.	1887-88. Tons.	1886-87. Tons.	1885-86. Tons.
Germany	955,000	935,000	1,015,600	838,105
Austria Hungary	525,000	400,000	550,000	369,000
France	490,000	420,000	497,000	298,408
Belgium	95,000	93,000	91,100	48,420
Holland a. s. . . .	65,000	55,000	50,000	37,500
Russia	450,000	430,000	455,000	526,200
	<hr/>	<hr/>	<hr/>	<hr/>
	2,580,000	2,333,000	2,658,600	2,117,633

For Mr. Licht's figures, see opposite page.

STOCKS OF SUGAR IN THE CHIEF MARKETS OF EUROPE ON THE
30TH NOVEMBER, FOR THREE YEARS, IN THOUSANDS
OF TONS, TO THE NEAREST THOUSAND.

Great Britain.	France.	Holland	German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1888.	TOTAL 1887.	TOTAL 1886.
146	159	16	248	*160	16	745	877	943

*Estimate.

CONSUMPTION OF SUGAR IN EUROPE FOR THREE YEARS, ENDING
30TH NOVEMBER, IN THOUSANDS OF TONS, TO THE
NEAREST THOUSAND.

Great Britain.	France.	Holland	German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1888.	TOTAL 1887.	TOTAL 1886.
1224	470	42	436	218	348	2738	2726	2570

ESTIMATED CROP OF BEET ROOT SUGAR ON THE CONTINENT OF EUROPE
FOR THE PRESENT CAMPAIGN, COMPARED WITH THE ACTUAL CROP,
OF THE THREE PREVIOUS CAMPAIGNS.

(From Licht's Monthly Circular.)

	1888-89.	1887-88.	1886-87.	1885-86.
	Tons.	Tons.	Tons.	Tons.
France.....	490,000 ..	392,824 ..	485,739 ..	298,407
German Empire ..	975,000 ..	942,441	1,012,968 ..	838,131
Austro-Hungary..	575,000 ..	408,616 ..	523,059 ..	377,032
Russia and Poland.	525,000 ..	441,342 ..	487,460 ..	537,820
Belgium	137,500 ..	135,000 ..	132,570 ..	88,421
Holland	45,000 ..	39,280 ..	36,098 ..	28,818
Other Countries..	67,500 ..	56,050 ..	56,050 ..	55,000
Total....	2,808,000	2,415,553	2,733,944	2,223,629

Mr. Licht, this month, reduces his estimate for 1888-89: for France, by 10,000 tons; Germany, 50,000 tons; and other countries, 7,000 tons. On the other hand he increases that for Russia by not less than 50,000 tons.

Mr. Görz's estimate for 1888-89 is 2,580,000 tons, or 228,000 tons below Mr. Licht's figure (see page 54).

STATE AND PROSPECTS OF THE ENGLISH SUGAR MARKET.

Our report for November holds good for December; the business done, notwithstanding the interruption of the Christmas holidays, has been large, and prices have been well maintained,—in some sorts there has been an advance.

The statistical position continues to grow in strength; but the only statistics which, it would seem, influence the market, are those of Mr. Licht. His monthly report is looked forward to with anxiety, and prices rise or fall as he increases or reduces his estimate. The fact does not seem to count, that his present estimate is some 200,000 tons in excess of other German statisticians, nor does the probability of a lessened cane crop.

The closing price for German 88% beet f.o.b. is 14s., and for forward delivery 1½d. to 3d. higher.

The imports of foreign refined for November were 40,687 tons, against 36,178 tons in 1887; and for the eleven months 284,632 tons, against 311,470 tons, for the same period last year.

The deliveries of sugar into the United Kingdom (four principal ports) up to 22nd December, as compared with 1887, show an increase of 43,517 tons, the imports an increase of 22,823 tons.

The stocks of sugar in the United Kingdom, on the 22nd December, were 152,807 tons, or a decrease upon December, 1887, of 29,440 tons.

Present quotations for the standard qualities, as under, are:—


FLOATING.		Last Month.
Porto Rico, fair to good Refining	13/6 to 14/-	against 13/6 to 14/-.
Cuba Centrifugals, 96% polarization	16/- to 16/3	„ 16/-
Cuba Muscovados, fair to good Refining..	13/6 to 14/-	„ 13/6 to 14/-.
Java, No. 15 to 16, good to strong	17/- to 17/3	„ 16/6 to 16/9.
LANDED.		Last Month.
Madras Cane Jaggery.. .. .	10/6 to 10/9	against 9/6 to 9/9.
Manila Cebu and Ilo Ilo	10/- to 10/9	„ 9/- to 9/6.
Paris Loaves, f.o.b.	18/3 to 18/6	against 18/- to 18/6.
Titlers	19/9	„ 19/6
Tate's Cubes.. .. .	21/9	„ 21/6
Austrian-German Beetroot, 88 % f.o.b. ..	14/-	„ 13/4½

THE SUGAR CANE.

No. 235.

FEBRUARY 1, 1889.

VOL. XXI.

 The writers alone are responsible for their statements.

N.B.—All communications to be addressed, and Cheques and P.O. Orders made payable to HENRY THORP, Ducie Chambers, 57, Market Street, Manchester.

For Scale of Charges for Advertisements, see page xi.

For Table of Contents, see page iii.

The Electric Sugar Refining Company, which has attracted so much notice since the well-trumpeted "demonstration" in September last, which really proved nothing, will take a prominent place in the history of successful commercial frauds.

The bursting of this bubble took, we imagine, very few of those directly connected with sugar by surprise. We are glad to hear that not more than about 15 shares in the Company were held by sugar men on this side. In *The Sugar Cane* for October, 1885, we gave the Prospectus of this Company.—Capital, \$1,000,000, in 10,000 shares of \$100 each. "Inventor" of the process Henry C. Friend, of New York. Office, 47, William Street, New York.

In December following we had an interview with Professor Friend in Liverpool, which was so unsatisfactory that we came away with the conviction that the whole thing was a swindle, and in the next month's *Sugar Cane*, (January, 1886,) we gave it as our opinion that those who had put money into the Company were not likely to see it again. In another part of the present issue (page 65) we give Mr. J. U. Robertson's account of how the fraud was found out, with some other particulars.

The sugar refiners in Canada, or most of them, have had a pretty good time of it for the past two years, some of them having realized as much as 100 per cent. upon their capital stock! The Woodside Refinery (Halifax, N.S.) forms, however, an exception. It has lost all its capital (£120,000) and is owing a large sum to outside creditors.

With such a disastrous result before them the shareholders will or ought to demand a rigid scrutiny into the management.

At an influential meeting held in Liverpool last month it was decided to present Baron H. de Worms, M.P., who represents one of the divisions of that city in Parliament, with an address and an invitation to a banquet on the 6th inst., for his important services on the Sugar Bounties Conference.

The Sugar Bowl and Farm Journal says that the Louisiana sugar crop can now, with certainty, be put down at 225,000 hogsheads (say 157,500 tons); although somewhat less than the last crop, the planters will net as much money, partly in consequence of the working expenses having been considerably lessened, and partly from the slightly higher price obtained for their sugar.

A New York correspondent writes:—(January 9) The Attorney-General of New York State has sued the North River Sugar Refinery Company for the forfeiture of its charter on the ground that its corporate existence ceased when it joined the so-called Sugar Trust. This is a nondescript association of seventeen corporations which would practically monopolise the sugar trade of the United States. The Judge of the Supreme Court has given judgment in favour of the Attorney-General. Apart from the interests directly involved, the principle of this decision is applicable to all so-called Trusts whose legal status involves a question scarcely second in importance to any at present before the people of the United States, and is doubtless analogous to the English Salt Trust. In order to form a sugar trust, various refineries reduced themselves to a common basis by incorporation, and they conveyed their shares to trustees with absolute power of control. As regards the trustees, Judge Barrett decides that this is an assumption of corporate power which has no warrant in law. As regards the composite refineries, such action is held to be an abandonment of the corporate franchise, and accordingly its dissolution is ordered.

On the 18th January the United States Senate adopted an amendment providing for the payment of a bounty of one cent. per pound on sugar made from beets, sorghum, or cane grown in the United States—equal to 4s. 8d. per cwt.—so that should the duties upon foreign sugar be reduced 50 per cent. the domestic producer would

stand in the same position practically as before, and the consumer be benefited. Taking the production of sugar in the United States at 200,000 tons, and we do not think it will reach this figure during the next five years at least, the Government will pay to the producers, say £1,000,000, out of the £5,500,000 revenue from sugar which will still be left after the reduction of 50 per cent. is made.

The *Deutsche Zuckerindustrie* declares that the proposed premium of 1 cent. per pound on sugar produced in the United States cannot be considered as a bounty on export, but only a favour granted to the "national production."

In the early spring there will be, according to the London correspondent of the *Glasgow Herald*, a perfect exodus of colonial governors from this country. Sir Henry Blake leaves for Jamaica towards the end of February; about the same time Lord Onslow sails for New Zealand; and in the first week in March the Earl of Kintore starts for South Australia. There is also a general movement in the judiciary of the Crown colonies. The Chief-Justice of Fiji goes to Hong Kong, Mr. MacLeod, Chief-Justice of the Gold Coast, goes in the same capacity to St. Lucia, the Chief-Justice of which has accepted the Attorney-Generalship of British Guiana, vacant by the promotion of the former holder, Mr. Haynes-Smith, to be Governor of the Leeward Islands.

£5,000 a year looks a large salary for the governor of one of our Australian colonies, and yet it would seem to fall short of the actual expenses incurred in some cases. Lady Musgrave, widow of the governor of Queensland, whose sudden death we have had so recently to notice, has shown her expenses book to the Premier of that colony, from which it appears that the cost of maintaining Government House was £8,000; and that had it not been that Lady Musgrave had a large private income, she and her husband would not have been able to keep up even a moderate style of living for the position in which they were placed. We know from Mr. Froude's highly interesting, though in many ways misleading book on the West Indies, how generously the governors of those islands which he visited entertained visitors.

The following is from *The Queenslander* (Brisbane), of December 1st, 1888:—

“The desperate state to which things are drifting in the sugar districts cannot be denied. One cannot take up a northern paper without meeting palpable proof of it. For instance, the Pleystowe sugar estate at Mackay is for sale. So is the leading local paper. The proprietor does not think it worth enough, in the face of the settled depression, to carry on. Last year, only 147 acres of cane were planted in the whole of the Douglas district. There is a drop of 24,000 tons of sugar in the year's yield. The Central Mill Scheme, at Mackay, is proving quite a failure. The lugubrious tale could be continued indefinitely. I have talked quite lately with several men, who have themselves been working on the plantations, and they all declare that white men neither will, nor can do much of the work which is required in the cane cultivation. Sincere speech on the subject is sooner or later inevitable.

The Yaryan Evaporator, according to the *Demerara Argosy*, is doing good work at *Reliance* plantation. It was started the other day in the presence of several gentlemen who were invited by Mr. Monson to see it. Although it had been working for a week, the tubes were perfectly clean, and they showed no sign of scale. So far, sugar making has been carried on at *Reliance* since the Yaryan has been erected with no other fuel than megass, which is burned direct from the mills.

The results obtained by nearly all the German sugar manufactories during the campaign 1887-1888 have already been noticed, month by month, in the *Sugar Cane*. The few which bring up the rear might naturally be expected not to present the most favourable results. Accordingly we find that the *Pakosch* manufactory, with a share capital of M.700,000, shows a loss of M.67,374, raising the deficit on the general balance-sheet to M.402,612, while that of *Görchen* (share capital M.500,000) has lost M.2,829, which amount has to be added to the balance of M.64,959 already on the wrong side in 1886-1887.

The *Rheinische Aktienverein* of Cologne, which has a capital of M.6,000,000 and possesses three factories and one works for extraction from molasses, pays 4% dividend. The stock of sugar on the 31st August, 1888, was valued at M.3,617,632.

The *Dessau Refinery*, which last year declared a dividend of 27½% on its capital of M.2,500,000, is able this year to pay 62½% and carry over M.11,752 to new account.

We continue to hear of new factories projected—in Germany, two,

in Austria, several; and the undertakings at Nauen, Buttstädt, Hatvan, and other places already mentioned in former numbers of this journal, are also being rapidly carried out. In addition to these new factories, *Opaleniza* is increasing its plant, so as to nearly double its production, and at *Northeim*, arrangements are being made with a similar view.

In Holland the Cultus-Maatschappij Soember-Kareng has been founded with a capital of fl.504,000 (£42,000), in shares of fl.3,500 (£291), to work the sugar plantation of Soember-Kareng, in Java.

According to the *Prager Zucker-Markt* and the *Deutsche Zucker-industrie*, a beet sugar manufactory is to be erected in Portugal, the promoters being Germans; the preliminary capital of £75,000 having already been subscribed. This is to form a beginning, trials having shown that Portugal can produce excellent beets. Fiscal arrangements will give the home product an advantage of nearly 10s. per cwt. (?).

The Secretary of State for the German Treasury has lately stated that the Government is prepared to carry out the obligations imposed by the Sugar Convention of August, 1888, and that the necessary legislative enactments are in course of preparation; but the German Government will only be in a position finally to carry out the terms of the Convention, on the understanding that full security is provided that sugars produced by countries not agreeing to the Convention shall be excluded from England, or so treated, that no injury to German sugar could arise from that quarter.

In November, 1888, the Silesian Branch of the Sugar Manufacturers' Union passed a resolution declaring that the London Convention was a measure conceived in the interest of English colonies and refiners, and prejudicial to the interests of beet sugar producers. This resolution it has now forwarded to the Government with a memorandum setting forth that the abstention of Belgium, France, and Austria, who are endeavouring to turn Germany out of the foreign markets, must have the effect of restraining Germany from abandoning her freedom of action and tying the hands of her sugar manufacturers in this competition. They assert that Germany ought to have made her assent conditional on the entrance into the Convention of the two important countries of France and Austria. It is evident that in Germany opinion differs, and is not favourable to the course adopted by the Government exclusively.

The Gibbs' Cylinder Dryers, some particulars of which may be found in our advertisement pages, appear to be gaining favour for sugar drying and granulating. There are now a considerable number of these machines running in our London refineries, and we learn that several have lately been exported to Australia, Java, &c., and still more recently to Belgium for sugar refinery at Tirlemont, the last mentioned apparatus having been sent out on approval, was only purchased after a month's careful trial of the process.

The makers of these machines (Messrs. H. & A. Gibbs, of Chingford, Essex), tell us further, that they have also been exporting extra size cylinders for megass drying, these are so constructed that they will telescope up into short lengths, for instance, an apparatus with a cylinder 40 in. by 5 in. diameter (recently sent out to Java), when packed for shipment, measured only 10 feet long, thus largely reducing freight.

A SUGAR SYNDICATE.—It is stated that the latest development of the Syndicate idea is the International Sugar Syndicate, which proposes to promote, or oppose legislative and other measures affecting the sugar trade, and to assist in the re-adjustment or modification of State subsidies, drawbacks, and bounties; and to prevent the use of deleterious substitutes for sugar. It is to do a variety of other things for the benefit of the sugar trade. The Syndicate was registered at Somerset, on Wednesday, January 2nd, 1889.

In the October number of *The Sugar Cane*, page 563, we gave an official table showing the consumption of sugar per head in the different countries of Europe and in the United States, from which it appears that, whilst our consumption is 70½ lbs. per head, that of the United States is 61 lbs. per head. Germany consumes not quite 19 lbs., France 27 lbs., and Russia 9 lbs. per head. The increase in the United States since 1880-84 is remarkable, being 23 lbs. per head. The figures here given, so far as the United States are concerned, are in excess of the fact, the consumption is about 50 lbs., the increase since 1880-84 about 12 lbs. per head. The entire consumption of the United States is over 1,300,000 tons, for to the imports at the Atlantic ports must be added the domestic production and the Hawaiian crop, which together will be about 250,000 tons. Taking as a guide the great increase since 1884, this 1,300,000 tons in five years time will reach 1,800,000 tons, for it is certain that during this period, a

reduction in the duties will take place which will greatly increase the consumption.

The Mark Lane Express in noticing a paper recently read by Mr. Wells, at the Surveyor's Institution, London, says that it was of a decidedly hopeful tone. The difficulties experienced by landlords in letting farms were less in almost every county than they were three or even a couple of years ago. The chief banks in the counties were known to be "more easy" towards farmers in the way of advances than they were in 1886 or 1887, and as there had been some improvement in general trade, the cause cannot be taken to be an augmented difficulty in "placing" money. Mr. Wells' conclusion without being one of brilliant hopefulness was, that neither the United States nor India can sell at lower rates than those which now prevail, while a four hundred acre arable farm at a reasonable rent may still return a profit to a tenant equal to nearly a sovereign per acre for labour, skill, and £4,000 invested.

In the German Reichstag, on 29th January, Herr Von Bennigsen raised the question of sugar bounties. He declared that the result of the London Conference was unsatisfactory, some Powers not having adhered to its decisions, while others made reservations. He stated that the cautious declarations of Count Herbert Bismarck with regard to the Conference corresponded with the wishes of the Reichstag, *that the Government should spare no effort to procure the abolition of the sugar bounties by means of international treaties.* Baron Von Moltzahn, Secretary to the Imperial Treasury, while expressing gratification at the agreement existing between the Reichstag and the Government, said no satisfactory result could be arrived at by the isolated action of Germany, and that the question could only be solved by means of a Convention.

Mr. J. B. Harrison, M.A., F.C.S., F.I.C., Inland Professor of Chemistry and Agricultural Science (Barbados), has kindly sent us the "Report of the results obtained on the Experimental Fields at Dodd's Reformatory, 1888," prepared by himself and Mr. J. B. Bovell, Superintendent Botanical Station (Barbados). It is a somewhat lengthy document, but full of valuable information for sugar cane planters. At page 70 we give the first portion of it.

At pages 101—105 we give some valuable statistics, taken from Messrs. F. Reid & Co.'s annual "table showing the consumption

or quantity retained for manufacturing purposes of the leading articles of commerce, and other statistics of the United Kingdom " for twenty years, 1869—1888. Under the head of sugar the consumption in 1888, as compared with 1887, shows a falling off—about $\frac{1}{2}$ lb. per head—but as compared with twenty years ago (1869) the increase is 26·74 lbs. per head; the consumption of tea, coffee, and cocoa in 1888, as compared with 1887, is about the same per head.

The agitators of the "Fair Trade" movement snatched a temporary victory at a meeting of the Manchester Chamber of Commerce on the 17th of December last. Although the Chamber consists of more than 1,000 members, only some 80 members were present on the occasion. Of these 50 to 60 were "Fair Traders," so that they were able to pass a resolution to the following effect:—"All goods of a nature and kind which we ourselves produce, offered in the markets of the United Kingdom, should pay that equal proportional share of the burden of Imperial and local taxation which they would have paid if produced or manufactured in the United Kingdom." There was no actual count taken on the decision, as, with few exceptions, the minority, seeing that they were momentarily defeated, walked out of the room. Of the 28 directors only five were present at any time during the sitting. This was a special meeting, and the "Fair Traders" present were mostly new members, not in the habit of attending the ordinary meetings. The annual meeting of the Chamber will be held this month, when we shall no doubt hear more of this resolution.

PARCEL POST TO CANADA.—The Parcel Post is now extended to all post offices in Canada. Parcels not exceeding 4 lbs. in weight may now be accepted for transmission to any post office in Canada, the service being no longer, as heretofore, restricted to certain selected offices.

The rates of postage are as follows:—

For each lb. or fraction of a lb.—To New Brunswick, Nova Scotia, Prince Edward Island, and the Province of Quebec, 1s. 3d.; to the Province of Ontario, 1s. 5 $\frac{1}{2}$ d.; to the Province of Manitoba and the North-West Territories, 1s. 8d.; to British Columbia and Vancouver Island, 1s. 10 $\frac{1}{2}$ d.

Dimensions.—Greatest length, 2 ft.; greatest breadth or depth, 1 ft.

We are compelled this month to omit our usual monthly list of patents. It will be given, with additions, in our March issue.

THE ELECTRIC SUGAR SWINDLE.

The collapse of the Electric Sugar Refining Company, New York, took, we imagine, very few of those directly connected with the sugar trade with surprise, and we are glad to learn that not more than about fifteen shares in this now famous company were held by sugar men on this side.

The history of the discovery of this ingenious and daring fraud is best given by reproducing a letter from Mr. J. U. Robertson, the treasurer of this company, published in the *Liverpool Mercury* of January 17th, to which we append a letter from Mr. W. P. Thompson, of Liverpool, through whose instrumentality mainly the fraud was found out.

We have never doubted from the first, and all through, Mr. Robertson's honesty of purpose; he most thoroughly believed in the process, and in inducing others to take shares in the company he was merely doing what he himself had done to the utmost of his ability. It was through his good offices that we had, in December, 1885, an interview with the "inventor," and the president of the company, Mr. Cotterill, in Liverpool. The impression left upon our minds by this interview was so unfavourable that we felt constrained to state in the next number of *The Sugar Cane* (January, 1886, page 6)—that "those who have put their money into this venture would, we were afraid, never see it again." We have received many letters from intending investors inquiring about the "process," and we are glad to think that we have prevented some of them at least from throwing their money away. We have not hesitated, when asked for our opinion, to speak of it as a great fraud.

The accounts of this fraud in some of the American papers are very characteristic. *The New York Tribune* devotes two columns of close print to it, and the headings are amusing. For instance—"Sugar men electrified," "A million dollars said to be sunk in the scheme—English firms will suffer most," "Possessing an important 'secret'," "Sugar materialising seances," "Vainly waiting for the electric thrill," "Lawson N. Fuller still hopeful—one of the largest stockholders thinks there may be no fraud—how he became interested in the scheme," "A visit to the Brooklyn factory. The watchman of large size but scant information—an empty, desolate, dirty building,"

"Claus Spreckels not a shareholder," "Alarm among English stockholders."

The *Times Democrat* (New Orleans) has the following heading to its account:—"Electric sugar refining a humbug," "Henry Friend's 'Secret Process' consisted of cube sugar and crushers. English and American financiers cleverly mulcted to the extent of a cool million," "A sensation at Birmingham."

The following is a copy of Mr. Robertson's letter, dated New York, January 4th, 1889:—

"I have a sorrowful tale to recite in this letter. I feel crushed beneath the terrible disclosure which we made this week, and I can see no ray of light to give hope, though others look with more encouragement upon certain things which seem to indicate that there is something at the bottom which has value. The particulars are briefly these:—Mr. Cotterill went on the 27th December to Milan, Michigan, where Mrs. Friend resides, for the purpose of arranging for the disclosure of the process. On the following day he and Mrs. Friend and Howard went from Milan to Ann Arbor, where her lawyers were. It is about 15 miles from Milan. Mr. Cotterill found her lawyers, whose names are Sawyer and Knowlton, to be a first-class firm in every respect; and in this he was most fortunate, for they, as soon as any occasion for suspicion arose, endeavoured to get at the bottom of it, and were open in declaring their determination to Mr. Cotterill, and helped him in this respect. Friday and Saturday were spent in discussing the contracts, which the lawyers had to master first, and everything went smoothly, without a suspicion of fraud. The points were, the taking out of letters of administration for purposes of applying for a patent, and the putting up of the \$70,000 in the hands of the trust company. Because they had not done all that we had demanded in the way of demonstrations, Mr. C. made a proposal to them that he would only put up \$35,000, and give a guarantee for the payment of the balance. This took time, but everything was arranged except the payment of the \$5,000, which was to be paid on the day of the disclosure. You must understand that we had agreed to pay Mrs. F. for the process the sum of \$75,000 as per contract with her—that is to say, \$70,000 to be put up in trust to be paid over several days after the disclosure on the completion of the papers, and \$5,000 to be paid her on the day of the disclosure. Mr. Cotterill proposed to pay this \$5,000 into the hands of her lawyers, to be paid over to her on the morning running of 14 or 15 bbls. To his surprise she objected to this course, and said the money must be paid to her. As this was an unreasonable proposition, Mr. Cotterill declined, and then a suspicion entered his mind for the first time, and he then pressed her to answer the question whether the refined sugar was made direct from

the raw or not. She evaded an answer to the question, and her lawyers took the ground of Mr. Cotterill that the question was a perfectly right and proper one, but all to no avail. The only conclusion which Mr. Cotterill could form under these circumstances was that something was wrong, and he telegraphed immediately to me to take precautions at the factory, and then came here.

"When he communicated his suspicions to me on his arrival, we at once determined that we would see the inside of the secret rooms, and we demanded an entrance from the watchman, who had the keys, and he opened the doors and we went upstairs. This was about noon of Wednesday, the 2nd instant. We saw on the granulating floor five wooden frames, which contained sets of sieves of the ordinary pattern, and the only thing remarkable about them was that they had not cost much money to construct. On the floor above, outside the secret room, we saw a large number of cases—some of them we had seen before, the jumbo case for instance—and behind a row of them there lay nearly all the 360 bags of the raw sugar which we had delivered to Howard to be refined. This was a sad spectacle, and my heart sank within me, and I felt sick all over. It was the first realisation that I had of the thing being a fraud. The watchman told us that the empty cases had only contained refined sugar, and not machinery; that the sugar had had something done with it to change its character, and that it came out of the barrels a solid cake. The lumps of sugar which I sent you over to put under glass is the identical sugar as it comes out of the barrels. With all these evidences of fraud being perpetrated upon us, we came to the office, and at once sent you the cable advising our conclusions. We at once sent information to Mr. Willett and others, and gave every publicity to it possible.

"On the following day—that is, yesterday—we went again to the factory and looked carefully over the whole thing again, and in the afternoon the strong room was entered through the hopper hole (by demolishing it) by Mr. W. P. Thompson, the patent agent, and young Mr. Cotterill; and there was found there only a crusher and about 30 barrels of the refined sugar, a trough for water, and some tables lined with tin, on which the sugar had evidently been drained after its bath. I saw these things myself this morning, and it was heart-sickening to behold the means by which a most shameful fraud had been perpetrated. It was so cold-blooded and cruel that I can scarcely realise its truth. But there is no doubt about it being a fraud of the most heartless kind. That is my mind on the subject; but Highet and others were not so certain. They conned the evidences over, and they came to the conclusion that there were certain things which required an explanation before they could satisfy themselves that it was all a delusion. They pointed out that it might have been worked by Friend in a very much more profitable

way for him than he did it if it were wholly a fraud—he could have sold some of his shares, for instance; he could have kept his promises as to dates, and so have created unbounded confidence in him, which would have enabled him to unload. That there were evidences in the preparations which have been made in the factory of another intent than the one which we unfortunately discovered, which seem to indicate that Friend changed his plan, and decided to defraud the company out of the process which he had sold them—for he need not have let the company into the large expense which he did on the building (and which was no profit to him) if he had not a proper intent in the beginning. That the refined sugar which he brought into the factory must have been at least treated by him, as it is a new product, and this treatment may be of considerable value, if not all the value claimed. That Mrs. Friend, in her discussion with Mr. Cotterill before the lawyers, showed an anxiety to retain intact a process apart and independent from the other matter. But, as I have said, I do not put any confidence in any of these matters, for I have been so grossly deceived and defrauded that I do not put any faith whatever in any of the Friends or their connections. It is a most lamentable and sickening affair, that I shudder when I think of all the pain and deep anxiety which it has caused to many good friends which we have had in England. It is terrible to think of the suffering which these cold-blooded monsters of cruelty have brought upon confiding and trusting men and women. I cannot understand it at all. Mr. Cotterill left last night for Michigan to take legal measures against all the people in the fraud. He will attach their property and arrest their persons, and we will leave no stone unturned to get everything which we can out of them for the benefit of the company. There are many things to be unravelled, and out of them we may get something of value. As soon as we know all I will advise fully.

“This letter is for the shareholders, and you can send copies of it to Birmingham. I do not think you need print it. I will myself get a full statement of the whole matter into print in due course, and render statements of account showing our receipts and expenditure, and so give every information to the shareholders which I can possibly afford.”

The following letter from Mr. W. P. Thompson has special reference to a hope, mentioned by Mr. Robertson, as being entertained by some of the shareholders, that after all there is an electric process. It is addressed to *The Liverpool Mercury* :—

“Gentlemen,—I have read with interest the published letter of Mr. Robertson, treasurer of the Electric Sugar Company, in which he mentions the hope a number of the shareholders have that, after all, there is an electric

sugar process. That this hope and the grounds on which it is based are utterly fallacious I will endeavour to show.

“The basis on which it rests is this. (1.) The sugar produced had 1 per cent. of grape sugar in it, a thing unknown in ordinary commercial refined sugar. (2.) The sugar had been run into barrels in the liquid state and congealed there, a practice unknown in any sugar refinery. (3.) There was a small heap of dark blue sugar in one corner of the room, and there seemed to be no object for this.

“Now, I would mention, in the first place, that if ordinary refined sugar is boiled with water under ordinary pressure it will in time change entirely into grape sugar, and the simple melting of it by water and heat in the open air will convert a small quantity into grape sugar. Secondly, all refiners in the United States add a very small quantity of ultramarine blue to the sugar to improve the colour, which would otherwise be slightly yellow.

“Taking these facts, let us see exactly what was done. Friend and the other adventurers wished to bring sugar surreptitiously into the factory as machinery. If they had brought sugar in lumps or grains in barrels into the factory, it might have leaked out on the way, and would have entailed the discovery of the fraud. To prevent this they got the sugar crystallised in the solid lump in barrels, and these barrels packed into the boxes which were supposed to contain machinery. In this way no grains of sugar could escape. Now, how did they get the sugar into the barrels? They dare not go to a refinery, and therefore they doubtless bought small parcels of sugar from numerous grocers. These they doubtless melted, with as little water as possible, in a potash kettle or its equivalent, and, when liquid, poured it hot into the barrels. Now, by melting it with heat in the open air and under ordinary pressure, at least 1 per cent. of grape sugar would form. Furthermore, when they poured it into the barrels, these being non-conductors of heat, it crystallised only very slowly, and consequently differed somewhat in appearance from ordinary refiners' sugar, which is run into moulds artificially cooled. As, too, the crystals only very slowly formed, the blue had time to separate and fall towards the bottom; consequently, when the whole solidified, the bottom layer of each barrel was deep blue, and had to be shaved off, hence why there was a heap of deep blue sugar in the corner. In this way every doubtful point is thoroughly explained.

“W. P. THOMPSON.

“6, Lord Street, Liverpool,
January 18th, 1889.”

REPORT UPON THE EXPERIMENTS AT DODD'S
(BARBADOS), FOR 1887-88.

BY MESSRS. J. B. HARRISON AND J. R. BOVELL.

Government Laboratory,
September 1st, 1888.

The HONOURABLE C. C. KNOLLYS, M.A., C.M.G., Colonial Secretary.

Sir,—We have the honour to forward to you, for the information of His Excellency the Governor, the following account of the work done in connection with and the results obtained upon the Experimental Fields at Dodd's Reformatory, during the growth of the crop for this year.

The experiments, as in previous years, were carried on in two directions; 1st., to ascertain the effects of certain of the manurial constituents of plant food upon the ordinary or Bourbon variety of sugar cane, upon the soil of, and under the climatic conditions existing at Dodd's; 2nd., under the same conditions, to ascertain the value of certain varieties of sugar cane by comparing them with the varieties previously cultivated or existing in the island, and also the value of some of them when cultivated under conditions differing greatly from our own. The investigation into the composition of the rainfall, commenced in 1885, was continued. It will be convenient to consider the experiments in the following order: 1st., the amount and composition of the rainfall; 2nd., the experiments with manures; 3rd., the experiments at Dodd's and at Little Island with the varieties of sugar cane.

PART I.

The amount and composition of the rainfall.

The rain was collected by means of a ten inch glass funnel and analysed. In all, sixty-five samples were analysed, representing the entire rainfall from the time of planting until the completion of the reaping of the canes. (December, 1886, to May, 1888, both inclusive.)

The rainfall amounted to 79·75 inches, and its true average contents of nitrogen and chlorine was:—

Milligrams per litre at 80° F. (parts per million).

Nitrogen as Ammonia Salts	·068
Nitrogen as Nitrates	·178
Chlorine	8·558

The extremes were:—

	Highest.	Lowest.
Nitrogen as Ammonia	·387 ..	·005
Nitrogen as Nitrates	1·185 ..	none.
Chlorine	47·042 ..	2·476

The weight of one inch of rain per acre at the temperature of 80° Fahr. being 225,680 lbs., the following were the quantities of water, nitrogen in two forms, and chlorine received per acre during the course of the experiments:—

	Lbs.
Water	17,997,980
Nitrogen as Ammonia .. .	1·22
Nitrogen as Nitrates	3·24
Chlorine	154

From the amount of chlorine found, we have estimated the weights of sodium and potassium chlorides added to the soil per acre. These were 216·7 lbs. of sodium chloride and 5·38 lbs. of potassium chloride equal to 3·4 lbs. of potash.

(A table (No. 1) is here given showing the amount and composition of the monthly rainfall for eighteen months ending May, 1888. For eight months of this period, May to November, 1887, and for January, 1888, the average was 6·63 inches, and for the other ten months 2·66 inches.)

PART II.

EXPERIMENTS WITH CHEMICAL MANURES.

Preliminary experiments.

These were undertaken with the objects of investigating the correctness of the determinations of the relative proportions of sucrose and glucose remaining in the megass, made in previous years during which we had assumed that no inversion, or not any to an appreciable extent, had occurred during the drying of the megass for its preservation for analysis; and as to whether the experiments might not, with advantage, be greatly simplified by determining the composition of a few selected canes from each plot, instead of crushing and drawing average samples of juice and megass from the whole of those grown. With regard to this latter object, we had to ascertain the possibility of drawing three to six canes from five to eight hundred so as to represent correctly the average composition of the whole number, and, as to whether the loss of weight which ensues upon keeping the canes between the time of their cutting and of the analysis is due only to loss of water, or is accompanied by loss of sugars as well.

The canes experimented upon were selected at Dodds by one of us with great care; their weights determined immediately as cut, forwarded to the laboratory, and their sugar contents ascertained by crushing the canes in a small hand-mill, yielding, according to the variety, &c., from 60 to 72 per cent. of juice. The sucrose and glucose in the expressed juice, and in the megass, were separately determined; the sucrose by the polariscope, the glucose by Soxhlet's modification of Fehling's test. It was found impossible, with our mill, completely to extract the sugar from the megass by repeatedly moistening with hot water and expressing, even when this treatment was repeated ten or twelve times; that contained in the cortical portions of the megass offering great resistance to extraction in this manner. The megass, after the sugars had been washed out as completely as we conveniently could do, was cut up finely, and either diffused directly, for from one to two hours, into a known weight of water, or extracted in a modified form of Soxhlet's apparatus, devised, for this purpose, by one of us. The additional amount of sugars thus obtained where the megass had been washed out as completely as possible by the mill, varied from '28 to '65 per cent. of the weight of the canes. Eleven experiments were made in this way for the determination of the sugar ratios in the juice and in the megass; the average of these showed that in the expressed juice the relation of the sucrose to the glucose was as 1 to '085, whilst in the megass it was 1 to '081, showing that as the proportion of glucose to sucrose is very much higher in our dried samples of megass than it is in the freshly-expressed juice, our assumption of no appreciable inversion having taken place during the preparation for preservation of the megass samples was incorrect, and that, practically, the ratio of sucrose to glucose in the expressed juice and in the megass is the same. The quantities of these constituents remaining in the samples of megass analysed, have therefore in each case been calculated to the ratio found in the corresponding expressed juice.

Several experiments were made to test the probability of drawing samples of a few canes, so that their composition should represent fairly the average composition of a large number. This we found, in practice, impossible to do, as is shown by the following determinations made upon three lots of Bourbon canes, four to six in each lot, cut at the same time and selected from the same plot as being, to the eye, nearly identical in character:—

No. of sample	1	2	3	4
No. of canes in sample	4	4	6	680
Weight of sample	30lbs. 15oz.	29lbs. 10½oz.	42lbs. 11½oz.	1 ton 17½cwt.
Weight of 1 cane	7lbs. 11¼oz.	7lbs. 6¾oz.	7lbs. 2 oz.	6lbs. 2½oz.
Per cent. Sucrose	14.93	14.00	12.83	13.96
Per cent. Glucose ....	.63	.68	.75	.53

No. 4 gives the results of the determination of the sugars based upon the crushing of the canes from one half of the plot equal to 20th of an acre; there is a very close accordance between these figures and the means of the three determinations, 13.92 per cent. sucrose and .69 per cent. glucose, but the differences between the separate determinations are so great that this is probably accidental. The results show, that, if sampled in this manner, the differences between the samples may easily be far greater than those sought to be ascertained, and further, that analyses of *single* canes, whether, of one variety grown under different conditions, or of different varieties grown under similar conditions are not only untrustworthy as to specific differences, but may easily be absolutely misleading. Several other experiments were made with different varieties of canes in a similar manner, but in no case did the composition of the small sample agree with that found when working upon the whole of the canes grown upon half of each plot, that is, upon quantities of from 18 to 37 cwts. each.

To ascertain the rate of loss of weight by keeping, and as to whether this loss consisted only of water, or of water and sugars, twelve experiments were made. In these bundles, consisting of from four to eight canes each, were weighed when cut, the canes divided in the middle and half of each cane used for analysis, taking alternately the top half of one cane and the bottom half of another; that is, in a bundle of eight canes, the top halves of four and the bottom halves of four were analysed. When divided in this manner, it was found that the composition of the portion analysed and of the portion to be kept were fairly similar. The remaining halves of the canes were kept in the laboratory, their weight determined daily, and were analysed at the expiration of from five to eleven days. The average loss of weight amounted to 1.04 per cent. per day, being much greater directly after cutting than later on, and was greatest in the case of a bundle of unripe Bourbon canes, amounting to 1.31 per cent., the remaining eleven samples varying between 1.19 per cent. the highest, to .87 per cent. the lowest. As regards the sugar contents, the following table shows the results of the experiments:—

TABLE No. 2.
EXPERIMENTS ON KEEPING SUGAR CANES.

KINDS OF CANES.	Number of days kept.	Loss of Weight per cent.	Canes as cut, per cent. of		Canes after keeping, per cent. (calculated to original weight) of		Apparent loss of Sucrose per cent.
			Sucrose.	Glucose.	Sucrose.	Glucose.	
Bourbon (unripe).....	6	7.89	8.68	2.34	7.95	2.66	.42
Purple Transparent.....	8	9.54	13.33	.46	10.90	1.79	1.16
White Transparent.....	8	7.00	10.88	1.30	9.83	1.80	.58
Keni Keni.....	7	7.04	12.38	.97	10.64	2.08	.69
Norman.....	6	5.62	9.43	1.26	8.85	1.43	.42
Purple Mauritius.....	7	7.9	10.48	1.30	8.38	2.78	.90
Bourbon.....	8	7.76	14.93	.63	12.28	1.62	1.71
Bourbon.....	8	8.42	14.00	.68	11.55	2.54	.57
Bourbon ..	11	11.84	14.00	.68	10.22	2.38	2.27
Red Ribbon.....	8	9.23	13.66	.41	9.66	2.66	1.90
Bourbon.....	8	7.30	12.83	.75	9.39	2.03	2.03
Bourbon.....	11	9.54	12.83	.75	8.87	2.71	2.16

Apparently, in each case, there has been a loss of sugars by keeping, the amount of which is very variable and which is probably due to cell fermentation. It is evident, therefore, that from the time which must necessarily elapse between the cutting of the samples of canes from the plots, which in each group of the experiments must take place as far as possible on the same day, and the date of analysis of some of them, if it were practicable to draw fair average samples, the composition of the canes as cut could not be ascertained with any approach to accuracy, not only from this loss but also from the great amount of inversion which has occurred. These results are practically the same as those obtained in the experiments of Boname in Gaudeloupe as reported on pages 150—152 in his classical monograph, "*La Culture de la canne à sucre à la Guadeloupe*," published in the *Annales de la Science Agronomique*, 1886, Vol. I.

We were, therefore, from these results, obliged to continue our experiments on the lines of those of the previous years, and to remain dependent for the completion of them upon the kindness of neighbouring planters.

The present method of carrying out the experiments.

The canes on the plots are topped and cut in the usual way, the tops on each lot being counted and weighed; the canes are carted to the mill yard, weighed, and passed through the mill, the juice is received into a clarifier and gauged, its temperature at the time of measurement being noted. A sample of the juice is taken, 50 cubic centimetres at 84° Fah. is measured into a one hundred cubic centimetre flask, treated with lead subacetate, alumina cream, and a small excess of sodium bi-sulphite; made up to the mark, filtered, and the sucrose determined in it by polarization, the instrument used being a very fine one, by Laurent, using ordinary light, sensitive to $\cdot 05\%$ with 200 m.m. tubes, and to $\cdot 02\%$ with those of 500 m.m. which was presented to one of us for use in these experiments, by Edward Easton, C.E., F.G.S.; the glucose is, at the same time, determined in it by Pavy's modification of Fehling's test. For these experiments, the Pavy's solution is previously standardised on freshly expressed cane juice, the glucose in which has been accurately determined by Soxhlet's method. Used in this manner, in our experience of some years, Pavy's modification is not only by far the most convenient for our work but leaves nothing to be desired either

in accuracy, ease of manipulation, or dispatch. These two determinations are, as a rule, completed in less than half an hour, from the crushing of the canes. Some of the sample of juice is placed in a bottle of known capacity containing a weighed amount of dry salicylic acid, which prevents fermentation and preserves it without change for some time. In this portion of the laboratory, the specific gravity is determined by the specific gravity bottle; the total solids by evaporating in large platinum basins a weighed quantity (two or three grammes) to dryness upon the water bath, and drying in the water oven until of constant weight; the ash is determined by evaporating a larger quantity to dryness and incinerating in a muffle at a barely visible red heat, and the nitrogen by Kjeldahl's method, using 20 to 21 grammes of the juice. From the volume of expressed juice, the temperature of measurement, and the specific gravity, the weight of juice obtained by the mill is calculated.*

During the crushing of the canes samples of the megass are constantly taken as it leaves the rollers, at once placed in light bags, weighed and sewed up; the bags are then placed where they attain a temperature of from 140 deg. to 150 deg. Fahr. and remain there until they have lost from 40 to 50% of their weight, the megass then containing from eight to ten per cent. of moisture. In this state the megass may be kept for a length of time without alteration. The bags are weighed before analysis, the contents cut up into pieces of from $\frac{1}{2}$ to $\frac{3}{4}$ inch mixed together, portions sampled out, which are cut up more finely and ground to a coarse powder. In this, the moisture and ash are determined in the usual way; 16.2 grammes extracted in the modified Soxhlet apparatus already mentioned, the extract clarified in the same way as the juice, made up to 200 cubic centimetres, filtered and the readings taken in either a sodium light or an ordinary light laurent instrument using the 400 m.m. tubes; the result thus obtained being occasionally checked by extracting 26.048 grammes and using a Soleil Scheibler instrument. The glucose is determined by either Pavy's or Soxhlet's method, corrections are made for the influence of the inverted sugar upon the polariscope readings, and the proportions of the sugars found are calculated into the ratio in which they were found to be in the juice. The fibre is determined by treating samples in the modified Soxhlet apparatus until free from

* In this report the density Beaumé is given in all cases at 60 deg. Fahr., in former reports it was given at a temperature of measurement.

soluble matters, drying, weighing, incinerating the dried samples and deducting the weight of ash found; the nitrogen is determined by Kjeldahl's method using from two to three grammes of the sample. From the data thus obtained upon the juice and the megass, the composition of the whole cane is calculated. This is of course, the composition of the canes as fed to the mill and not as grown upon the field, a loss of moisture varying from one to occasionally as much as two per cent. taking place between the cutting of the canes and their weighing previous to crushing. There is also loss from evaporation in the megass as it leaves the mill, but from special experiments which we have made this does not, if the sample is quickly drawn, amount to more than one per cent. on the weight of the megass. Although, therefore, our method has not that claim to exact accuracy which is desirable, we believe that it is far more accurate as regards the average composition of the canes upon the feeding trough of the mill, the place where the importance of the composition is greatest, and as regards the relative proportions of the constituents of the canes as grown upon the plots, than methods based upon purely laboratory analyses of small samples of a few canes each, whether selected upon the feeding trough of the mill or on the plots themselves.

THE FIELD EXPERIMENTS WITH MANURES.

Nature and previous history of the field.

The field used for these experiments (Summervale field) was the same used for those of 1885-86, the composition of the soil of which was given in the report for 1886.* It is the poorest field upon the estate, the soil containing (in August, 1886) ·102% of nitrogen, ·079% phosphoric anhydride, and ·106% of potash. After the cutting of the canes in 1886, Woolly Pyroe (*Phaseolus mungo*) was grown upon the field and turned in as a green dressing, no pen manure was used, and after the soil had undergone thorough tillage and was apparently in first rate agricultural condition, the canes were planted upon the plots in December, 1886. The spring of canes was somewhat irregular, due in great part to the low initial fertility of the field, and pointing out to us the importance of in future dressing this field as we had done with it in 1884, and as in the case of the field used last year, in 1885, with compost some weeks before planting the canes. Where the spring of canes was not satisfactory, the results obtained

* See *Sugar Cane*, 1886, pages 353, 404.

upon the plots were corrected by eliminating the unsatisfactory plants and calculating the results obtained upon the number of remaining ones to the number usually grown upon an acre, instead of calculating the result as from sixty clumps of canes. Each plot consisted of 60 cane holes, 6 ft. square, and was approximately, one twentieth of an acre.

The experiments were arranged in two groups; to examine, in the first into the effects of the addition of nitrogen in different forms and in different proportions; in the second group, which was sub-divided, into the effects of the addition of phosphates in different forms and proportions, and of potash. In each group, the plots received in addition to the constituent experimented upon, such quantities of the other important constituents of sugar cane manures as our previous experience had shown to be in sufficient quantity to allow of the full development of the effects of the one under investigation.

The constituents of the manures used were supplied by Mr. H. E. Thorne of the Antilles Manure works, and were, as will be seen by reference to Table 3, of excellent quality.

The manures were mixed, and applied under our personal supervision on June 15th, half the nitrogen only being applied at this time, the remainder on August 3rd. In addition to the plots manured with the artificial manures, we laid down unmanured plots, a plot heavily manured with pen or farm-yard manure applied in November, 1886, whilst a portion of the plot which had been very heavily manured with this manure in 1884, was left unmanured, and another portion of it manured with sulphate of ammonia. As far as lay in our power we took care to render the factors of exposure to light, wind, and rain, and the soil conditions as nearly alike as possible on the different plots.

The canes were reaped on May 7th and the following days, being then as ripe as we could hope for them to become on account of the continued rains and were weighed, crushed, and the juice measured at the works of Bushby Park, the property of Messrs. Thomas Daniel & Co., Limited, which through the great kindness of the owners, of Mr. G. A. Sealy, the attorney; and of Mr. W. C. Hutson, the manager; were placed at our disposal for that purpose. As in 1887 our special thanks are due to the latter of these gentlemen, for the great interest which he took in assisting us in every way, and to

Mr. J. C. Armstrong for very valuable assistance rendered to us in many ways during the reaping of our experiments. We may here mention that this portion of the experiments was owing to the almost incessant rains, carried out under great difficulties.

In the various tables, the results are given in the same manner as in 1887, the value of the available sugar in the juice expressed, being estimated at \$1.25 per 100 lbs.; the available sugar being determined from the amount of sucrose and glucose present as was fully explained in that year's report. In addition we have given two columns, one showing the percentage of sucrose contained in the canes, the other the total sucrose contained in them per acre. A comparison of the latter figures with those showing the amount of sucrose in the expressed juice per acre will prove of interest to many of our planters.

Experiments with Pen Manure and with Nitrogen—Series I.

This group of experiments consisted of fourteen plots, of which one remained unmanured, one having been very heavily manured in 1884 with pen manure, also remained unmanured, whilst another similarly treated in 1884, received nitrogen at the rate of forty pounds per acre in the form of sulphate of ammonia, (these plots formed plot No. 1 of the 1886 report), and one received twenty tons per acre of pen manure in November, 1886. The remaining plots each received superphosphate of lime and sulphate of potash, supplying assimilable phosphates and potash at the rate of 84 and 25 lbs. respectively, per acre. One of these plots received nothing further, three of them 40, 60, and 80 lbs. per acre respectively, of nitrogen in the form of sulphate of ammonia, three, similar amounts in the form of nitrate of soda, one plot received 40 lbs. of nitrogen per acre at one dressing in form of finely ground dried blood, another 20 lbs. as dried blood, and after dressing of 20 lbs. as sulphate of ammonia, and another 35 lbs. as dried blood and a top dressing of 20 lbs. as sulphate of ammonia. Tables Nos. 4 and 5, give the field and mill results of this series of experiments, whilst Tables Nos. 6, 7, and 8, show the composition of the canes, cane juice, and megass.

TABLE No. 3.
PRICE PER TON AND COMPOSITION PER CENT. OF THE MANURES USED.

Names of Manures.	Price Per Ton.	Nitrogen.	Equal to Ammonia.	Soluble Phos- phates.	Reverted Phosphates.	Insoluble Phosphates.	Potash.
Sulphate of Ammonia.....	\$ cts. 75 00	20.86	25.33				
Nitrate of Soda.....	60 00	15.95	19.67				
Dried Blood	50 00	11.60	14.03				
Superphosphates	28 00	. .	...	32.67	2.52	2.15	
Precipitated Phosphate	40 00	. .	...	....	....	55.00	
Aruba Phosphate Meal	30 00	. .	...	...	..	70.75	
Sulphate of Potash	80 00	. .	....	. .	....		51.22

TABLE No. 4.
RESULTS OF THE REAPING OF THE CANES.—NITROGEN SERIES.

MANURING OF PLOTS.	Cost of Manure per Acre.	Number of Canes		Weight per Acre of						Weight in lbs. of			Gain in cwt. of Produce upon	
		Per Acre.	Per Clump.	Produce.	Cane Tops.		Canes.	Tons. Cwts.	Tons. Cwts.	One Cane Top.	One Cane.	One Clump.	No Manure	No Nitrogen.
					Tons.	Cwts.								
No Manure.....	\$ c.	10,607	8-8	16 3	4 6	11 17				.91	2-50	25-13	....	....
Pen Manure, 1884.....	30 0 } in 1884 }	11,132	9-2	25 10½	4 11½	20 19½				.89	4-22	38-8	187-5	....
Pen Manure, 20 tons, in 1886.....	30 0 }	15,730	13-0	35 5½	6 19½	28 5½				.99	4-03	52-3	382-5	....
Pen Manure, 1884, ammonia sulphate, 40lbs. Nitrogen.....	6 70	14,780	12-2	31 16½	5 6½	26 9½				.81	4-01	49-	313-5	....
Cinereals, sulphate potash and super-phosphate.....	4 80	13,710	11-3	23 16¾	5 3½	18 13½				.84	3-05	34-5	153-7	....
Cinereals and ammonia sulphate, 40lbs. Nitrogen.....	11 60	15,810	13-1	33 6	6 7½	26 18½				.90	3-79	49-8	343-	189-3
Cinereals and ammonia sulphate, 60lbs. Nitrogen.....	14 85	15,125	12-2	35 5	6 19½	28 6½				1-01	4-19	52-5	382-	228-3
Cinereals and ammonia sulphate, 80lbs. Nitrogen.....	18 20	15,600	12-9	41 19½	7 10½	31 9				1-08	4-95	63-8	516-2	362-5
Cinereals and nitrate of soda, 40lbs Nitrogen.....	11 50	16,710	13-7	33 17½	6 17	27 0½				.92	3-61	50-	354-5	200-8
Cinereals and nitrate of soda, 60lbs. Nitrogen.....	14 85	14,116	11-7	34 6¾	7 7½	27 19				1-01	4-43	51-7	363-7	210-
Cinereals and nitrate of soda, 80lbs. Nitrogen.....	18 20	14,840	12-3	35 13	6 15	29 18				.86	4-51	55-3	390-	236-3
Cinereals and dried blood, 40lbs. Nitrogen.....	12 60	14,780	12-2	30 9½	6 0	24 9½				.91	3-71	45-3	286-5	132-8
Cinereals, dried blood, 20lbs. Nitrogen, ammonia sulphate, 20lbs. Nitrogen.....	11 82	14,680	12-1	32 12	6 7½	26 4½				.97	4-00	48-5	329-	175-3
Cinereals, dried blood, 35lbs. Nitrogen, ammonia sulphate, 20lbs. Nitrogen.....	15 68	14,720	12-1	33 7½	6 8	26 19½				.97	4-10	49-9	344-5	190-8

TABLE No. 5.

RESULT OF THE CRUSHING OF THE CANES.—NITROGEN SERIES.

MANURING OF PLOTS.	167° F. Imperial Gals. of Juice per acre.	60° F. Density, Baumé.	Percentage of Juice by Mill.	81° F. Lbs. per Im- perial Gallon of Sucrose.	Glu- cose.	Percentage of Sucrose in Cans.	Lbs. per Acre of Sucrose		Available Sugar in Juice.	Profit by Mauring per Acre upon	
							In Cans.	In Juice.		No Manure	No Nitro- gen.
No Manure	1,350	11.3	53.9	2.093	-.034	13.40	3,557	2,811	2,705	\$ cts.	\$ cts.
Pen Manure, 1884.....	2,445	11.7	57.2	2.096	-.040	14.96	7,024	5,022	4,875	27 16	....
Pen Manure, 1886.....	3,460	11.1	57.7	1.918	-.034	13.78	8,731	6,501	6,320	15 22	....
Pen Manure, 1884, ammonia sulphate—40lbs. Nitrogen	3,279	11.7	58.2	2.124	-.038	15.30	9,131	6,823	6,637	42 49	....
Cinereals.....	2,105	11.4	53.3	2.054	-.051	13.98	5,848	4,234	3,923	10 46	....
Cinereals and ammonia sulphate—40lbs. Nitrogen..	3,308	11.7	58.2	2.145	-.042	14.98	9,085	6,953	6,747	39 6	28 60
Cinereals and ammonia sulphate—60lbs. Nitrogen..	3,677	11.6	61.5	2.025	-.050	14.53	9,233	7,206	7,020	30 13	28 66
Cinereals and ammonia sulphate—80lbs. Nitrogen..	4,294	10.9	58.8	1.934	-.060	14.28	10,980	8,129	7,674	43 95	33 49
Cinereals and nitrate of soda—40lbs. Nitrogen	3,281	11.3	57.4	4.031	-.041	14.42	8,726	6,494	6,302	33 50	23 04
Cinereals and nitrate of soda—60lbs. Nitrogen	3,626	11.3	61.2	1.989	-.062	14.30	8,955	7,046	6,769	35 24	24 78
Cinereals and nitrate of soda—80lbs. Nitrogen	3,751	11.2	59.3	1.966	-.060	13.57	9,088	7 220	6,883	34 06	23 60
Cinereals and dried blood—40lbs. Nitrogen.....	3,020	11.6	57.7	2.099	-.029	14.93	8,185	6,215	6,0 5	29 68	19 22
Cinereals and dried blood—20lbs. Nitrogen sulphate of ammonia—40lbs. Nitrogen	3,333	11.3	60.0	1.937	-.041	13.84	8,134	6,430	6,223	32 19	22 73
Cinereals and dried blood—35lbs. Nitrogen sulphate of ammonia—20lbs. Nitrogen	3,280	11.3	57.5	1.918	-.047	12.69	7,580	6,157	5,524	24 58	14 12

TABLE No. 6.
COMPOSITION OF THE CANES.—NITROGEN SERIES.

MANURING OF PLOTS.	Water.	Sucrose.	Glucose.	Ash.	Albu- minoids.	Organic Matters.	Fibre.	Nitrogen in Albu- minoids.
No Manuring.....	66.34	13.40	.21	.56	.28	1.77	17.38	(.044)
Pen Manure, 1884.....	66.01	14.96	.28	.48	.29	3.49	14.49	(.046)
Pen Manure, 1886.....	67.65	13.78	.21	.46	.19	2.08	15.63	(.030)
Pen Manure, 1884, and ammonia sulphate—40lbs. Nitrogen	66.33	15.39	.26	.50	.24	1.60	15.68	(.039)
Cinereals	65.91	13.98	.28	.54	.30	1.66	17.23	(.049)
Cinereals and ammonia sulphate—40lbs. Nitrogen	66.64	14.98	.29	.38	.22	1.58	15.01	(.035)
Cinereals and ammonia sulphate—60lbs. Nitrogen.....	68.91	14.53	.35	.28	.24	2.22	13.47	(.039)
Cinereals and ammonia sulphate—80lbs. Nitrogen.....	68.05	14.23	.48	.48	.29	1.65	14.82	(.047)
Cinereals and nitrate of soda—40lbs. Nitrogen	66.74	14.42	.28	.45	.30	1.97	15.84	(.048)
Cinereals and nitrate of soda—60lbs. Nitrogen	70.22	14.30	.39	.39	.23	1.18	13.29	(.036)
Cinereals and nitrate of soda—80lbs. Nitrogen	68.20	13.57	.40	.43	.25	2.13	15.02	(.040)
Cinereals and dried blood—40lbs. Nitrogen.....	65.82	14.93	.19	.56	.25	3.01	15.24	(.040)
Cinereals and dried blood—40lbs. Nitrogen, ammonia sulphate—20lbs. Nitrogen.....	68.01	13.84	.28	.46	.21	2.90	14.30	(.033)
Cinereals and dried blood—35lbs. Nitrogen, ammonia sulphate—20lbs. Nitrogen.....	68.20	12.69	.28	.57	.22	2.42	15.62	(.036)

TABLE No. 7.
COMPOSITION OF THE JUICE OF THE CANES, NITROGEN SERIES.

MANURING OF PLOT.	Water.	Sucrose.	Glucose.	Ash.	Albuminoids.	Organic Matters.	Nitrogen in Albuminoids.
No Manure.....	78.62	19.34	.31	.23	.08	1.42	(.014)
Pen Manure, 1884	78.12	19.32	.37	.23	.07	1.89	(.011)
Pen Manure, 1886	79.23	17.74	.31	.28	.09	2.35	(.015)
Pen Manure, 1884, and ammonia sulphate	78.11	19.56	.34	.23	.08	1.68	(.014)
Cinereals.....	79.01	18.96	.38	.23	.12	1.30	(.020)
Cinereals and ammonia sulphate—40lbs. Nitrogen....	78.49	19.77	.39	.23	.08	1.04	(.014)
Cinereals and ammonia sulphate—60lbs Nitrogen....	79.26	18.67	.46	.18	.07	1.36	(.011)
Cinereals and ammonia sulphate—80lbs. Nitrogen....	80.20	17.91	.63	.40	.08	.78	(.013)
Cinereals and nitrate of soda—40lbs. Nitrogen	78.38	18.76	.38	.24	.07	2.17	(.012)
Cinereals and nitrate of soda—60lbs. Nitrogen	79.77	18.38	.57	.19	.09	1.00	(.016)
Cinereals and nitrate of soda—80lbs. Nitrogen	80.01	18.17	.55	.36	.07	.84	(.012)
Cinereals and dried blood—40lbs. Nitrogen.....	77.97	19.35	.26	.28	.09	2.05	(.015)
Cinereals and dried blood—20lbs. Nitrogen, ammonia sulphate—20lbs. Nitrogen	79.38	17.90	.37	.26	.04	2.05	(.007)
Cinereals and dried blood—35lbs. Nitrogen, ammonia sulphate—20lbs. Nitrogen	79.76	17.73	.43	.50	.06	1.54	(.010)

TABLE No. 8.
COMPOSITION OF THE MEGASS, NITROGEN SERIES.

MANURING OF PLOTS.	Water.	Sucrose.	Glucose.	Ash.	Albri- minoids.	Organic matters.	Fibre.	Nitrogen in Albuminoids.
No Manure.....	52.00	6.46	.09	.95	.51	2.29	37.70	(.082)
Pen Manure, 1884.....	49.83	9.13	.16	.83	.60	5.58	33.87	(.094)
Pen Manure, 1886.....	51.88	8.39	.13	.71	.33	1.60	36.96	(.053)
Pen Manure, 1884, ammonia sulphate—40lbs. } Nitrogen.....	49.93	9.58	.15	.88	.48	1.42	37.56	(.077)
Cinereals.....	50.97	8.30	.16	.90	.52	2.24	36.91	(.083)
Cinereals and ammonia sulphate—40lbs. Nitrogen	50.16	8.32	.15	.60	.43	2.28	38.06	(.069)
Cinereals and ammonia sulphate—60lbs. Nitrogen	52.39	7.92	.18	.44	.52	3.56	34.99	(.083)
Cinereals and ammonia sulphate—80lbs. Nitrogen	50.74	9.01	.26	.60	.60	2.82	35.97	(.097)
Cinereals and nitrate of soda—40lbs. Nitrogen ..	51.07	8.59	.16	.75	.62	1.63	37.18	(.099)
Cinereals and nitrate of soda—60lbs. Nitrogen ..	55.17	7.90	.23	.71	.44	1.30	34.25	(.071)
Cinereals and nitrate of soda—80lbs. Nitrogen ..	51.00	6.88	.19	.54	.53	3.96	36.90	(.085)
Cinereals and dried blood—40lbs. Nitrogen.....	51.25	8.73	.11	.97	.47	1.91	36.56	(.076)
Cinereals and dried blood—20lbs. Nitrogen, am- monia sulphate, 20lbs. Nitrogen	50.95	7.76	.15	.76	.48	4.14	35.76	(.077)
Cinereals and dried blood, 35lbs. Nitrogen, and ammonia sulphate—20lbs. Nitrogen.....	52.60	5.73	.12	.67	.45	3.68	36.75	(.073)

(To be continued.)

MORTALITY IN THE WEST INDIES (CHIEFLY BARBADOS).

We are indebted to the editor of the *Journal of the Institute of Actuaries* for permission to print a summary of a paper "On the Mortality of Assured Lives in the West Indies (chiefly Barbados)," compiled by Messrs. G. F. Hardy and H. J. Rothery, and read at a meeting of the Institute a short time ago. As the opinions generally entertained respecting the average duration of life in the West Indies are frequently very erroneous, we think the subject of sufficient interest to a large number of our readers to warrant our devoting a few pages to a carefully compiled summary. The data on which the tables were compiled were obtained from the experience of three Life Assurance Companies—the Barbados Mutual, the Scottish Amicable, and the Standard :—

1. *Barbados Mutual Experience.*—The Island of Barbados is only 166 square miles, but upon this small surface are supported no less than 171,860 persons, according to the census of 1881, showing the unusually large proportion of 1,035 persons to the square mile. Nearly all the land is under cultivation, principally for the production of the sugar cane.

The temperature of the island usually varies from about 65° to 86° Fahr. in the shade, the readings being taken 430 feet above the sea level. There is generally a cool Atlantic breeze blowing over the whole island, and on the very picturesque eastern coast the climate during certain portions of the year is all that could be desired; and, in fact, Barbados is looked upon as a health resort by many Americans, as well as by inhabitants of other parts of the West Indies.

The Barbados Mutual Life Assurance Society was established in the year 1840, and its history has been one of uninterrupted prosperity.

It may be considered that the experience of the Barbados Mutual will give an indication of the rate of mortality in a tropical climate under the most favourable circumstances. The figures submitted to the members of the Institute possess more than usual interest, being of the character of a standard of minimum tropical mortality, with which the mortality experiences gathered from other parts of the tropics may be compared.

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The experience upon which the tables which follow are principally based covered the period from the commencement of the society in 1840 to the close of the year 1882, in respect of which a report was made to the society by Mr. G. F. Hardy in the year 1884.

The particulars were extracted from the society's books, and written upon cards prepared for the purpose. Duplicate assurances were eliminated, so that the experience relates to "lives," and not to "policies." The experience in Barbados itself has been kept distinct from that of the various agencies in other parts of the West Indies, and the mortality table, afterwards given in full, has been prepared from the Barbados experience only.

The annexed Table (see page 90) gives a summary of the results for Barbados only, the actual number of deaths being compared with the deaths "expected," according to the Northampton and the Institute of Actuaries' *H_M* Tables, showing also the ratio of the actual deaths to the deaths expected.

The Northampton Table was adopted as a measure of comparison for several reasons. In the first place it is well known that the rate of mortality shown by it, for an ordinary population, is unduly high. Again, the Barbados Mutual Office had, from its commencement up to the last valuation, based all its calculations, whether for premiums, valuations, or surrender-values, upon this table; and Mr. Stott showed that the mortality experience of the Scottish Amicable Society in the West Indies was more nearly represented by the Northampton than by any other known table.

The results of the experience were thought to be of sufficient importance for a full mortality table to be superimposed upon them; and in the next table is given (A) the exposed to risk and deaths at each age, with the rate of mortality for the whole experience; and (B) the corresponding values when the first two years of assurance have been excluded—in this case, both the unadjusted and adjusted rates of mortality being shown. (See pages 90 and 91.)

There appeared to be sufficient reasons for omitting the first two years of assurance, in forming the final mortality table.

The numbers at risk being comparatively small, it was found necessary to graduate the experience so as to get a full table, in which the necessary allowances for all contingencies were made.

2. *Scottish Amicable Experience*.—This experience being very fully

described in Mr. John Stott's paper in the 21st volume of the *Journal*, already referred to, it was unnecessary to do more than tabulate the results.

3. *Standard Life Office Experience*.—The experience of this office is one of considerable extent, embracing no less than 22,169 years of life, so that the results are of great importance. In addition to the mortality experience of lives under exposure to a tropical climate, a table has been prepared showing the experience of such lives after their return to Europe.

The distribution, geographically, of the 1,292 deaths comprised in the Combined or Aggregate Experience is as follows:—Barbados, 399; Jamaica, 209; Demerara and Berbice, 202; Trinidad and Tobago, 123; St. Vincent, 80; Grenada, 75; Dominica, 69; Antigua, 59; St. Kitts, 40; St. Thomas, 13; miscellaneous, 23.

The comparison of results as regards the incidence of mortality may be considered to confirm the opinion expressed in Mr. G. F. Hardy's paper on Native Indian Mortality (*J.I.A.*, xxv. 235)—that the effect of tropical climate upon the mortality of Europeans increases with the period of exposure. It may here be noted that this remark refers only to acclimatized lives.

It may then be inferred that the effect of exposure to tropical climate upon the rate of mortality among acclimatized lives can be best represented by a constant addition to the force of mortality, combined with an addition to the age. The monetary values as deduced from the adjusted Barbados Mortality Table exhibit such a relation when compared with the corresponding H_M values.

As regards the Barbados Mutual Experience (Chief Office and Agencies) an investigation was made into the causes of the deaths that had occurred, a comparison being instituted with the expected numbers as estimated upon the basis of the Registrar-General's Returns for the years 1861-1880 (England and Wales).

The results are shown in the following table (page 93), and it should be mentioned that, in calculating the estimated deaths, the lives have been dealt with in decennial groups of ages corresponding to those in the Registrar-General's Returns.

An examination of the table on page 94, will show certain interesting divergencies. It will be seen that while in the West Indies diseases of the zymotic class, and diseases of the brain and nerves and of the digestive organs, prove more fatal than in England, the excessive mortality

from these causes is partly counterbalanced by a comparative immunity from phthisis and from diseases of the respiratory organs.

The facts furnished by Mr. Thomson as to the mortality prevailing among lives (who have resided in the West Indies) after their return to Europe are as follow, a comparison of the expected deaths according to the H_M Table, and as estimated on the basis of the Standard West Indian rates of mortality shown in a former table being also given:—

Standard Experience of Lives, who have resided in the West Indies, after their return to Europe.

Ages.	Exposed to Risk.	Actual Deaths.	EXPECTED DEATHS.	
			H _M .	Standard, West Indies.
20-29	102	..	1	1
30-39	503	4	4	8
40-49	720	13	9	19
50-59	670	16	14	25
60-69	374	24	15	21
70-79	78	7	7	10
	2,447	64	50	84

The number of the observations is small, but the facts are sufficient to indicate a considerable improvement in the mortality consequent upon the cessation of the extra risk, although the rates still remain higher than those prevailing among assured lives in this country. It is probable that some lives return invalided to England, and that this may account for the excess in the rate of mortality above that of the H_M Table.

In the discussion which followed the reading of the paper it was stated that the experience of the Scottish Amicable in Jamaica gives an average of 2.04 per cent. of mortality, differing but little from that of the Barbados Mutual, which was 2.00 per cent., and the comparison holds good at the mean ages. It must not be forgotten that the statistics naturally refer to selected lives, and that those who insure are, as a rule, those who take care of themselves. The Barbados experience must be taken to refer to a large extent to native lives, as distinguished from those of born Europeans.

Barbados Experience, 1840-1882.—Actual Number of Deaths compared with the Number of Deaths Expected, according to the Northampton and HM Tables.

Ages.	1ST AND 2ND YEARS OF ASSURANCE.						3RD TO 5TH YEARS OF ASSURANCE.						6TH AND SUBSEQUENT YEARS OF ASSURANCE.						TOTAL EXPERIENCE.						
	Actual Deaths.			Expected Deaths.			Actual Deaths.			Expected Deaths.			Actual Deaths.			Expected Deaths.			Actual Deaths.			Expected Deaths.			Ages.
	No.	Ratio	HM.*	No.	Ratio	HM.*	No.	Ratio	HM.*	No.	Ratio	HM.*	No.	Ratio	HM.*	No.	Ratio	HM.*	No.	Ratio	HM.*	No.	Ratio	HM.*	
29 ..	9	18	50	8	1.12		9	16	56	7	1.29		6	10	60	4	1.50		24	44	55	19	1.26	29	
30-39..	10	23	43	11	91		18	32	56	15	1.20		64	64	1.00	31	2.06		92	119	77	57	1.61	30-39	
40-49..	5	12	42	6	83		12	12	63	10	1.20		88	105	84	54	1.63		105	136	77	70	1.50	40-49	
50-59..	1	4	25	2	50		5	7	71	4	1.25		88	90	98	56	1.57		94	101	93	62	1.52	50-59	
60-69..	..	..	..	..	..		1	1	1.00	1	1.00		54	48	1.13	40	1.35		55	49	1.12	41	1.34	60-69
70 ..	..	..	..	..	..		..	..	..	..	..		15	13	1.15	13	1.15		15	13	1.15	13	1.15	70
ALL AGES	25	57	44	27	93		45	75	60	37	1.22		315	330	95	198	1.59		385	462	83	262	1.47	ALL AGES	

* HM, Table of the Institute of Actuaries.

† Actual to Expected.

Barbados Mutual Chief Office Experience, 1840-1882.

Age.	(A) ENTIRE EXPERIENCE.			(B) EXCLUDING FIRST 2 YEARS OF ASSURANCE.				Age.
	Exposed to Risk.	Died.	Rate of Mortality per cent.	Exposed to Risk.	Died.	Rate of Mortality per cent.	Adjusted Rate of Mortality.	
14	2	..	·00	..	..	..	·88	14
15	10	..	·00	..	..	..	·90	15
16	15	..	·00	1	..	·00	·92	16
17	20	..	·00	8	..	·00	·94	17
18	31	..	·00	13	..	·00	·96	18
19	50	..	·00	19	..	·00	·98	19
20	75	..	·00	27	..	·00	1·00	20
21	115	3	2·61	43	2	4·65	1·03	21
22	151	..	·00	59	..	·00	1·06	22
23	195	1	·51	89	..	·00	1·09	23
24	229	2	·87	129	2	1·55	1·12	24
25	268	1	·37	163	..	·00	1·15	25
26	329	7	2·13	194	4	2·06	1·19	26
27	366	2	·55	232	2	·86	1·23	27
28	429	5	1·17	287	2	·70	1·27	28
29	478	3	·63	328	3	·91	1·31	29
30	520	8	1·54	382	7	1·83	1·35	30
31	549	6	1·09	418	5	1·20	1·39	31
32	613	8	1·31	455	7	1·54	1·43	32
33	624	6	·96	484	6	1·24	1·47	33
34	646	9	1·39	529	9	1·70	1·51	34
35	677	9	1·33	553	8	1·45	1·55	35
36	688	12	1·74	558	11	1·97	1·59	36
37	692	12	1·73	577	11	1·91	1·64	37
38	682	9	1·32	585	8	1·37	1·69	38
39	686	13	1·90	594	10	1·68	1·74	39
40	685	12	1·75	591	12	2·03	1·79	40
41	658	12	1·82	580	9	1·55	1·84	41
42	637	15	2·35	581	15	2·58	1·89	42
43	624	9	1·44	568	9	1·58	1·94	43
44	591	18	3·05	543	16	2·95	2·00	44
45	567	8	1·41	528	8	1·52	2·06	45
46	538	10	1·86	504	10	1·98	2·12	46
47	515	6	1·17	484	6	1·24	2·19	47
48	493	8	1·62	464	8	1·72	2·27	48
49	466	7	1·50	437	7	1·60	2·36	49
50	452	12	2·65	425	12	2·82	2·46	50
51	403	10	2·48	385	10	2·60	2·57	51
52	372	12	3·23	362	12	3·31	2·69	52
53	344	11	3·20	330	11	3·33	2·82	53
54	312	9	2·88	302	8	2·65	2·96	54

Age.	(A) ENTIRE EXPERIENCE.			(B) EXCLUDING FIRST 2 YEARS OF ASSURANCE.				Age.
	Exposed to Risk.	Died.	Rate of Mortality per cent.	Exposed to Risk.	Died.	Rate of Mortality per cent.	Adjusted Rate of Mortality.	
55	288	6	2.08	280	6	2.14	3.11	55
56	268	13	4.85	257	13	5.06	3.27	56
57	248	10	4.03	236	10	4.24	3.44	57
58	226	7	3.10	219	7	3.20	3.63	58
59	203	4	1.97	199	4	2.01	3.84	59
60	179	10	5.59	176	10	5.68	4.07	60
61	157	8	5.10	155	8	5.16	4.22	61
62	136	4	2.94	136	4	2.94	4.60	62
63	120	5	4.17	120	5	4.17	4.91	63
64	113	5	4.42	113	5	4.42	5.26	64
65	100	6	6.00	100	6	6.00	5.65	65
66	85	5	5.88	85	5	5.88	6.09	66
67	66	4	6.06	66	4	6.06	6.58	67
68	56	1	1.79	56	1	1.79	7.12	68
69	47	7	14.89	47	7	14.89	7.71	69
70	38	2	5.26	38	2	5.26	8.35	70
71	34	1	2.94	34	1	2.94	9.05	71
72	26	1	3.85	26	1	3.85	9.81	72
73	18	4	22.22	18	4	22.22	10.63	73
74	12	2	16.67	12	2	16.67	11.52	74
75	6	1	16.67	6	1	16.67	12.49	75
76	5	1	20.00	5	1	20.00	13.55	76
77	3	1	33.33	3	1	33.33	14.70	77
78	2	1	50.00	2	1	50.00	15.95	78
79	1	..	.00	1	..	.00	17.30	79
80	1	..	.00	1	..	.00	18.76	80
81	1	..	.00	1	..	.00	20.36	81
82	1	..	.00	1	..	.00	22.04	82
83	1	..	.00	1	..	.00	23.88	83
84	1	..	.00	1	..	.00	25.85	84
85	1	..	.00	1	..	.00	27.92	85
86	1	..	.00	1	..	.00	30.22	86
87	1	..	.00	1	..	.00	32.61	87
88	1	1	100.00	1	1	100.00	35.10	88
89	..	..	..	..	..	..	..	..
Totals	19,243	385	2.00	16,210	360	2.22	..	Totals

GENERAL RESULTS.
Summary of West Indian Experience.

Ages	BARBADOS MUTUAL.						SCOTTISH AMICABLE.			STANDARD.			AGGREGATE EXPERIENCE.			Ages.
	Barbados.			Agencies.			At Risk.	Died	Mortality per cent.	At Risk.	Died	Mortality per cent.	At Risk.	Died	Mortality per cent.	
	At Risk.	Died	Mortality per cent.	At Risk.	Died	Mortality per cent.										
Under 30	2,763	24	·87	1,100	17	1·55	627	11	1·75	2,225	21	·94	6,715	73	1·09	Under 30
30-39	6,377	92	1·44	2,611	45	1·72	2,054	39	1·90	7,031	115	1·64	18,073	291	1·61	30-39
40-49	5,774	105	1·82	2,321	55	2·37	1,949	42	2·15	7,086	190	2·68	17,130	392	2·29	40-49
50-59	3,116	94	3·02	981	32	3·26	1,019	35	3·43	4,074	153	3·76	9,190	314	3·42	50-59
60-69	1,059	55	5·19	233	16	6·87	282	9	3·19	1,457	83	5·70	3,031	163	5·38	60-69
70 & upwds	154	15	9·74	33	3	9·09	35	3	8·57	297	38	12·79	519	58	11·37	70 & upwds.
All Ages	19,243	385	2·00	7,279	168	2·31	5,966	139	2·33	22,170	600	2·71	54,658	1292	2·36	All Ages.

Deaths from Various Causes in the Barbados Mutual Assurance Society, and the Estimated Deaths under each Class according to the Returns of the Registrar-General for England and Wales (1861-80).

CAUSES OF DEATH.	BARBADOS.		AGENCIES.	
	Actual Deaths.	Estimated.	Actual Deaths.	Estimated.
I. <i>Zymotic</i> :—				
Typhoid Fever	13		2	
Typhus Fever	2		1	
Pypho-Malarial Fever	2		3	
Yellow Fever	4		3	
Ague and Fever	3		..	
Other Fevers	20		15	
Smallpox	1		..	
Thrush	4		..	
Diarrhoea	12		2	
Dysentery	6		9	
Cholera	5		..	
Various	6	78 24	1	36 8
II. <i>Constitutional</i> :—				
Cancer	6		5	
Phthisis	21		16	
Various	13	40 85	8	29 32
III. <i>Brain and Nervous System</i> :—				
Brain Disease	14		11	
Apoplexy	36		8	
Paralysis	8		1	
Epilepsy	7		2	
Insanity	4		..	
Various	15	84 39	1	23 13
IV. <i>Heart, &c.</i> :—				
Heart Disease	23		6	
Dropsy	7		3	
Various	6		5	14 13
V. <i>Lungs, &c.</i> :—				
Bronchitis	5		2	
Pneumonia	10		6	
Lung Disease	6		..	
Various	15	36 58	1	9 19
VI. <i>Organs of Digestion</i> :—				
Gastritis	5		3	
Liver Disease	25		15	
Heptatitis	7		3	
Jaundice	7		3	
Various	17	61 24	14	38 8
VII. <i>Urinary Organs</i> :—				
Kidney Disease	7		4	
Various	5	12 12	2	6 4
VIII. <i>Violence</i> :—				
Suicide	4		..	
Various	8	12 27	5	5 9
IX. <i>Old Age and other Causes</i>	26	26* 26	8	8† 7
ALL CAUSES .. .. .	..	385 332	..	168 113

* Including six "unknown."

† Including one "unknown."

Barbados Mortality Table.

Age.	Number Living.	Decrement.	Probability of Life for One Year.	Probability of Death for One Year.	Expectation of Life.
15	100,000	900	·9910	·0090	38·71
16	99,100	911	·9908	·0092	38·06
17	98,189	922	·9906	·0094	37·41
18	97,267	933	·9904	·0096	36·76
19	96,334	945	·9902	·0098	36·11
20	95,389	958	·9900	·0100	35·46
21	94,431	972	·9897	·0103	34·81
22	93,459	987	·9894	·0106	34·17
23	92,472	1,004	·9891	·0109	33·53
24	91,468	1,023	·9888	·0112	32·89
25	90,445	1,044	·9885	·0115	32·26
26	89,401	1,066	·9881	·0119	31·63
27	88,335	1,088	·9877	·0123	31·01
28	87,247	1,109	·9873	·0127	30·39
29	86,138	1,129	·9869	·0131	29·77
30	85,009	1,148	·9865	·0135	29·16
31	83,861	1,166	·9861	·0139	28·55
32	82,695	1,183	·9857	·0143	27·95
33	81,512	1,199	·9853	·0147	27·35
34	80,313	1,214	·9849	·0151	26·75
35	79,099	1,228	·9845	·0155	26·15
36	77,871	1,242	·9841	·0159	25·55
37	76,629	1,256	·9836	·0164	24·96
38	75,373	1,271	·9831	·0169	24·37
39	74,102	1,286	·9826	·0174	23·78
40	72,816	1,300	·9821	·0179	23·19
41	71,516	1,313	·9816	·0184	22·60
42	70,203	1,325	·9811	·0189	22·01
43	68,878	1,337	·9806	·0194	21·42
44	67,541	1,349	·9800	·0200	20·84
45	66,192	1,362	·9794	·0206	20·25
46	64,830	1,376	·9788	·0212	19·66
47	63,454	1,392	·9781	·0219	19·08
48	62,062	1,411	·9773	·0227	18·50
49	60,651	1,433	·9764	·0236	17·92
50	59,218	1,458	·9754	·0246	17·34
51	57,760	1,485	·9743	·0257	16·77
52	56,275	1,514	·9731	·0269	16·20
53	54,761	1,544	·9718	·0282	15·63
54	53,217	1,574	·9704	·0296	15·07
55	51,643	1,604	·9689	·0311	14·51
56	50,039	1,634	·9673	·0327	13·96
57	48,405	1,665	·9656	·0344	13·41
58	46,740	1,697	·9637	·0363	12·87
59	45,043	1,729	·9616	·0384	12·34

Age.	Number Living.	Decrement.	Probability of Life for One Year.	Probability of Death for One Year.	Expectation of Life.
60	43,314	1,762	·9593	·0407	11·82
61	41,552	1,795	·9568	·0432	11·30
62	39,757	1,829	·9540	·0460	10·79
63	37,928	1,863	·9509	·0491	10·29
64	36,065	1,897	·9474	·0526	9·79
65	34,168	1,930	·9435	·0565	9·30
66	32,238	1,963	·9291	·0609	8·82
67	30,276	1,991	·9342	·0658	8·26
68	28,285	2,013	·9288	·0712	7·91
69	26,272	2,025	·9229	·0771	7·48
70	24,247	2,025	·9165	·0835	7·07
71	22,222	2,011	·9095	·0905	6·67
72	20,211	1,283	·9019	·0981	6·29
73	18,228	1,938	·8937	·1063	5·92
74	16,290	1,877	·8848	·1152	5·56
75	14,413	1,800	·8751	·1249	5·22
76	12,613	1,709	·8645	·1355	4·89
77	10,904	1,603	·8530	·1470	4·58
78	9,301	1,483	·8405	·1515	4·28
79	7,818	1,353	·8270	·1730	4·00
80	6,465	1,213	·8124	·1876	3·73
81	5,252	1,068	·7964	·2036	3·48
82	4,148	922	·7796	·2204	3·24
83	3,262	779	·7612	·2388	3·01
84	2,483	642	·7415	·2585	2·79
85	1,841	514	·7208	·2792	2·59
86	1,327	401	·6978	·3022	2·40
87	926	302	·6739	·3261	2·22
88	624	219	·6490	·3510	2·05
89	405	153	·6223	·3777	1·89
90	252	103	·5913	·4087	1·74
91	149	66	·5571	·4429	1·60
92	83	39	·5301	·4699	1·48
93	44	22	·5000	·5000	1·34
94	22	12	·4546	·5454	1·18
95	10	6	·4000	·6000	1·00
96	4	3	·2500	·7500	·75
97	1	1	·0000	1·0000	·50

NOTES ON BOOKS.

"SUGAR: A HANDBOOK FOR PLANTERS AND REFINERS," being a comprehensive treatise on the culture of sugar-yielding plants, and the manufacture, refining, and analysis of cane, beet, palm, maple, melon, sorghum, milk and starch sugars; with copious statistics of their production and commerce by Charles G. W. Lock, F.L.S., B.E.R., and I. A. R. Newlands, F.G.S., F.C.S.; illustrated by 73 plates and 240 engravings; one vol. thick, 8vo.; 1888; E. & F. N. Spon, London. (Price, 30s.)

It is six years since "Sugar Growing and Refining," the joint production of Messrs. C. G. Warnford Lock, G. W. Wigner, and R. H. Horland, was issued, and although the number of readers of such a work must necessarily be somewhat limited, it is satisfactory to learn that the edition has been exhausted, and that a new work under the above title, bringing the information up to date, has been brought out.

The new publication is edited by Mr. Lock (above mentioned) in conjunction with Messrs. Benjamin E. R. Newlands, and John A. R. Newlands, names which are in themselves a sufficient guarantee for the accuracy of the statements therein contained, more especially as regards scientific and chemical matters.

It is to a considerable extent a reproduction of the original work, but is largely supplemented by valuable new matter and information rendered necessary by the continual progress of discovery, and the adoption of new processes and machinery, which have so strikingly characterised the present decade.

It is only necessary to point to the relative figures of sugar production, both cane and beet, since the time when the original volume appeared, amounting in the case of cane sugar to an increase of 360,000 tons, and in that of beet sugar to 1,060,000 tons, to indicate to the fullest extent the value of a comprehensive and scientifically accurate account of the production and manufacture of sugar, which, prior to the appearance of this book in 1882, scarcely existed in the English language.

A careful examination of the 900 pages comprised in the present work has resulted in the conviction that we have here a mass of reli-

able information relative to the various processes which are now in use or are being introduced in sugar manufacture, and the machinery and appliances employed, the information being fully up to date, and not needlessly burdened with scientific and technical terms.

One of the most interesting processes which, after having to a great extent replaced the older methods of extraction in use in the beet sugar manufacture, seems now on the eve of being extensively applied to cane sugar also, is that of diffusion. To this 58 pages of the new work are devoted, supplying a very clear and intelligible account of the history and development of the diffusion system and its apparatus, and a description of the essential differences between the diffusion system and those hitherto in use, and showing plainly the advantages, which seem incontestable, of the new process, but also not ignoring the considerable difficulties which, quite apart from the question of cost of the introduction of totally new machinery, attends the adoption of this system in cane growing countries, and must not be left out of sight; we refer to the question of fuel in connection with the excessive amount of water contained in the residua of the diffusion process, and on this subject we note with satisfaction that the valuable communication of Mr. Paton, which not long ago appeared in the *Sugar Cane*, has been fully utilised.

A considerable proportion of the information relating to beet sugar has naturally been obtained from French and German publications, and we see with pleasure that the translations are on the whole very well executed, and that, with a few unimportant exceptions, the English equivalents of foreign terms have been judiciously chosen. We think, however, that in stating the yield of sugar obtained from the beet, the authors should have distinctly intimated that the remarks on page 510, which give the proportion of $8\frac{1}{2}$ lbs. of sugar to 100 lbs. of beets, apply exclusively to results obtained in French manufactories; according to the *Prager Zuckermarkt*, the results in Austria-Hungary are considerably better, viz., 11%, and the figures for the best German works are, on the authority of the German official statistics (see *Sugar Cane*, April, 1888,) even higher, viz., $12\frac{1}{2}\%$.

Again, with respect to the results obtained in the manufacture of sorghum sugar, as quoted at some length on pp. 534-547, derived naturally to a considerable extent from statements published by parties interested in the disposal of lands, these details must be taken

cum grano, and the remark on page 512, that "it does not appear that these plants possess any solid advantage over beet, not to speak of cane," does not sufficiently cover the ground as regards this still very debateable question.

As a sample of the clear and practical manner in which economic questions are treated, we may quote the following, page 47 :—

"Touching the begass, Wray recommends it to be carried back to the fields by the same carts which bring in the canes, and would have it immediately ploughed or trenched into the soil. In practice, this is very rarely done, despite the volumes that have been written in support of the plan. The reason for this apparent anomaly is sufficiently simple. The sugar factory consumes a very large quantity of fuel, and fuel in the shape of coal or wood is usually very dear and scarce in sugar-growing districts. Hence has arisen the generally-accepted custom of using the begass for fuel, and returning only the ashes (which it leaves behind when burned) to the soil. In this way, a portion of the salts is certainly conveyed back to the soil, but the act of burning has reduced them to an insoluble condition, and their value is thereby greatly diminished. An advantage in burning is the destruction of insect larvæ, and it has sometimes to be resorted to on that account, but it must always be at the expense of the manurial value of the material burnt. This question of returning the begass to the soil just as it comes fresh from the mill cannot be decided off hand, as it will depend on circumstances. These circumstances are, that the estate requires both manure and fuel, that the fresh begass will afford either one or the other (but not both), and consequently that the one which is not so supplied must be derived from other sources. The point that then arises for the planter to settle is, which of the two materials (manure and fuel) can be best procured by exterior means. The conditions of each estate will determine the best course to pursue. In any case, the canes must be brought to the mill, and their bulk implies the expenditure of considerable labour in carrying them back to the fields, just at a moment, too, when all hands are fully employed. Viewing the improvements which have lately been made in the preparation of cane manures, and the highly concentrated form in which they are now supplied, there is little likelihood of planters departing from the old way; and should success attend the newly invented furnaces for burning undried begass (described on a later page), there will be still greater inducement to adhere to the current custom. This being so, only the ash of the begass can be counted on as manure. This will amount to about 5 cwt. from each 100 tons of cane crushed and burned, and its manurial value will not exceed 8s. per cwt. It should be preserved with the other waste under a shed out of the rain till used. There

will probably be an additional 5 cwt. of ash from other sources (trash, wood, &c.,) worth about 6s. per cwt."

We have pleasure in recommending this highly interesting and valuable book to all who are desirous—whether for practical ends or merely because they require readable and instructive information respecting this important industry—of possessing a reliable and dependable manual, which has the further advantage of being furnished with a tolerably complete index.

NEW METHOD OF CANE PLANTING.

We have just heard of a new method of cane planting, which is being introduced in Réunion. The cutting is no longer laid horizontally at the bottom of the hole, and covered with a small quantity of earth, as has been done from time immemorial. On the contrary, in the new process the vertical position is adopted.

This is how it is done. To begin with, the two to four ounces of artificial manure, which are usually employed, are put at the bottom of the hole, which is filled up with the whole quantity of the dung usually applied three or four months after planting. In the middle of the hole thus prepared and filled up, a sort of shaft is formed by means of a strong crowbar, plunged deeply enough to reach the hard soil, and enter it for one or two inches, and in this is placed the cane plant, the heart of which is scarcely visible at the surface of the hole.

Experiments, made over a tolerably large area in February last, are said to have produced most wonderful results. While the eyes of the upper part of the plant rapidly throw out the first stems, those of the lower portion swell to an enormous extent, and penetrating the surrounding soil, finally emerge in very large shoots, to such a degree that the bunch of canes attains, in a few months, quite unusual proportions.

A trial would cost nothing; and if the results really are such as are stated, there is no doubt that everyone will hasten to adopt a method of planting, of which the first consequence would be the suppression of the expensive operation, which has to be continually renewed, known under the name of *dévidage*.—*Le Mouvement à l'île Maurice*.

TABLE, SHOWING THE CONSUMPTION OR QUANTITY RETAINED FOR
MANUFACTURING PURPOSES OF THE LEADING ARTICLES
OF COMMERCE, AND OTHER STATISTICS OF THE
UNITED KINGDOM.

FOR TWENTY YEARS 1869-1888.

Compiled by Francis Reid & Co., Brokers, Liverpool.

Year.	ESTIMATED POPULATION 31st Dec.	SUGAR. Raw and Refined.		MOLASSES.		TEA.		COFFEE.	
		Tons	Lbs. per Head.	Tons.	Lbs. per Head.	Lbs.	Per Head.	Lbs.	Per Head.
1869	30,750,000	583,369	42.17	37,088	2.70	111,889,118	3.64	29,109,113	0.94
1870	31,100,000	666,368	48.00	35,790	2.50	117,622,575	3.78	30,629,710	0.99
1871	31,500,000	720,201	49.93	34,181	2.43	123,529,642	3.92	31,010,645	0.98
1872	31,750,000	715,400	50.47	31,045	2.19	127,792,412	4.02	31,661,311	1.00
1873	32,000,000	786,033	55.02	28,220	1.97	132,022,155	4.12	32,330,928	1.01
1874	32,200,000	853,845	59.40	13,705	0.96	137,422,563	4.27	31,860,080	0.99
1875	32,400,000	942,703	65.17	37,375	2.58	145,458,120	4.36	32,526,256	1.01
1876	32,700,000	852,438	58.39	21,540	1.47	149,132,185	4.56	33,342,288	1.02
1877	33,000,000	834,692	56.66	13,910	0.94	151,275,237	4.58	32,830,224	0.99
1878	33,200,000	903,597	60.97	30,943	2.09	157,691,762	4.75	33,393,248	1.00
1879	33,500,000	914,742	61.13	36,057	2.41	160,652,187	4.80	34,696,256	1.04
1880	34,000,000	946,094	62.33	8,617	0.57	158,570,334	4.66	32,569,824	0.96
1881	35,300,000	989,208	62.77	12,672	0.80	160,225,789	4.54	31,943,408	0.90
1882	35,700,000	992,893	62.30	8,679	0.54	165,079,881	4.62	31,962,560	0.89
1883	36,000,000	1,066,464	66.36	17,079	1.06	170,812,697	4.74	32,448,080	0.90
1884	36,300,000	1,071,155	66.09	17,163	1.06	175,097,983	4.82	33,016,256	0.91
1885	36,600,000	1,147,351	70.22	17,581	1.07	182,455,982	4.98	33,410,272	0.91
1886	37,000,000	1,100,861	66.65	18,253	1.15	178,894,151	4.83	32,391,184	0.88
1887	37,500,000	1,180,590	70.52	12,485	0.75	183,635,885	4.89	30,052,064	0.80
1888	38,000,000	1,185,892	69.91	10,592	0.63	185,556,214	4.88	31,135,328	0.82

NOTE.—For statistics prior to 1869, and from 1843, see the *Sugar Cane* for February, 1883, pages 94—103.

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UNITED KINGDOM.

FOR TWENTY YEARS, 1869-1888.

Compiled by Francis Reid & Co., Brokers, Liverpool.

Year.	COCOA.		RICE.		TOBACCO.		TALLOW.		WINE.	
	Lbs.	Per Head.	Tons.	Lbs. per Head.	Lbs.	Per Head.	Tons.	Lbs. per Head.	Gallons.	Per Head.
1869	6,564,216	0.21	175,038	12.75	41,719,500	1.36	59,056	4.30	14,840,158	0.48
1870	6,942,109	0.21	92,802	6.72	41,717,012	1.34	77,879	5.32	15,168,321	0.50
1871	7,333,988	0.23	103,649	7.37	42,775,334	1.36	67,630	4.81	16,237,756	0.52
1872	7,853,165	0.25	189,796	13.39	43,948,427	1.38	60,644	4.28	16,873,955	0.53
1873	8,311,023	0.26	162,042	11.37	45,944,485	1.44	73,976	5.18	18,027,104	0.57
1874	8,863,579	0.28	144,010	10.02	45,787,816	1.40	57,575	4.01	17,284,385	0.54
1875	9,973,926	0.31	168,687	11.66	47,026,912	1.45	45,052	3.11	17,349,370	0.54
1876	10,423,478	0.32	152,742	10.46	47,681,858	1.46	63,579	4.36	18,671,089	0.57
1877	10,060,637	0.30	192,355	13.06	49,300,088	1.49	56,300	3.82	17,671,273	0.54
1878	9,980,162	0.30	112,669	7.60	47,969,263	1.44	42,347	2.86	16,272,295	0.49
1879	10,111,526	0.30	181,167	12.11	47,309,809	1.41	49,100	3.28	14,945,093	0.45
1880	10,566,159	0.31	217,219	14.31	48,261,775	1.42	54,808	3.61	15,852,335	0.47
1881	10,897,795	0.31	253,563	16.09	48,481,049	1.38	42,896	2.72	15,644,757	0.44
1882	11,996,853	0.34	212,035	13.30	49,055,938	1.37	44,993	2.82	14,431,282	0.40
1883	12,868,170	0.36	198,537	12.35	49,565,605	1.38	39,921	2.48	14,382,983	0.39
1884	13,963,891	0.33	158,152	9.76	50,772,513	1.40	45,720	2.82	14,075,625	0.39
1885	14,595,168	0.40	121,457	7.43	51,325,060	1.40	42,085	2.58	13,848,748	0.38
1886	15,165,714	0.41	177,812	10.76	50,972,001	1.38	39,599	2.39	13,252,503	0.36
1887	15,873,698	0.42	128,084	7.64	52,156,389	1.39	29,280	1.07	13,694,476	0.36
1888	18,227,017	0.48	164,352	9.69	53,262,678	1.42	41,521	2.45	13,500,109	0.35

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FOR TWENTY YEARS, 1869-1888.

Compiled by Francis Reid & Co., Brokers, Liverpool.

Year.	BRITISH & FOREIGN SPIRITS.		FOREIGN WOOL.		COTTON.		RAW SILK	
	Gallons.	Per Head.	Lbs.	Per Head.	Lbs.	Per Head.	Lbs.	Per Head.
1869	29,624,124	0.96	141,853,383	4.61	948,298,512	30.81	2,524,215	0.08
1870	31,707,609	1.02	166,819,579	5.36	1,099,751,092	35.36	3,638,782	0.17
1871	34,454,883	1.09	184,412,542	5.73	1,406,281,520	44.64	4,961,500	0.16
1872	33,618,968	1.06	165,397,521	5.21	1,142,620,304	36.30	3,949,890	0.12
1873	37,779,940	1.19	189,824,608	6.12	1,318,087,232	41.19	2,718,322	0.09
1874	40,510,613	1.26	194,438,122	6.04	1,427,984,768	44.35	3,201,506	0.10
1875	42,427,400	1.31	189,059,859	5.84	1,233,200,864	38.06	1,939,019	0.06
1876	41,796,449	1.28	213,065,992	6.51	1,291,165,568	39.48	2,943,904	0.09
1877	40,420,555	1.22	218,546,900	6.62	1,188,365,920	36.01	2,784,453	0.08
1878	40,722,383	1.23	196,195,351	5.90	1,194,310,320	35.97	2,333,393	0.07
1879	38,475,646	1.15	167,793,165	5.01	1,287,063,568	38.42	2,517,273	0.08
1880	35,764,464	1.05	222,945,958	6.56	1,404,697,616	41.31	2,733,676	0.08
1881	37,094,323	1.05	181,684,961	5.15	1,466,423,616	41.54	1,986,628	0.06
1882	36,916,312	1.03	220,513,147	6.18	1,504,107,696	42.13	2,458,970	0.07
1883	36,765,068	1.02	216,929,406	6.03	1,474,421,088	40.96	2,660,000	0.07
1884	36,634,194	1.01	242,662,342	6.66	1,485,037,792	40.91	4,142,730	0.11
1885	35,956,465	0.99	233,514,124	6.39	1,203,496,224	32.88	1,698,719	0.04
1886	34,894,662	0.94	281,484,150	7.61	1,503,099,360	40.62	1,699,361	0.05
1887	34,833,096	0.91	255,098,448	6.80	1,488,612,944	39.70	2,371,742	0.06
1888	35,143,495	0.92	297,008,584	7.82	1,432,778,592	37.70	3,078,436	0.08

TABLE, SHOWING THE CONSUMPTION OR QUANTITY RETAINED FOR
MANUFACTURING PURPOSES OF THE LEADING ARTICLES
OF COMMERCE, AND OTHER STATISTICS OF THE
UNITED KINGDOM.

FOR TWENTY YEARS, 1869-1888.

Compiled by Francis Reid & Co., Brokers. Liverpool.

Year.	TOTAL VALUE OF IMPORTATIONS.		TOTAL VALUE OF BRITISH AND IRISH PRODUCE EXPORTED.		RAILWAYS IN UNITED KINGDOM.		
	£	Per Head.	£	Per Head.	Capital Expended.	Per Head.	Nett Profit % cent.
1869	295,460,214	192/1	190,045,230	123/7	490,950,770	319/4	4.45
1870	303,257,493	195/0	199,586,322	128/1	504,381,000	324/4	4.49
1871	330,754,359	210/0	223,066,162	141/1	520,400,000	330/5	4.69
1872	353,375,740	222/7	255,961,609	161/3	537,285,640	338/5	4.83
1873	370,380,742	230/3	255,073,336	159/5	569,047,346	355/8	4.75
1874	368,435,432	228/11	239,436,207	148/9	578,320,308	359/2	4.80
1875	373,941,125	230/10	223,494,570	138/0	590,223,494	361/0	4.72
1876	375,093,771	229/5	200,639,204	122/6	658,214,776	402/7	4.17
1877	393,941,256	238/9	198,731,073	120/4	674,059,048	408/7	4.13
1878	366,059,610	220/6	192,804,334	116/2	698,545,154	420/10	4.25
1879	362,127,741	216/2	191,503,672	114/4	717,000,000	428/10	4.15
1880	411,210,656	241/2	222,810,526	131/1	728,317,000	432/4	4.38
1881	395,656,350	224/2	233,938,919	132/7	745,528,162	422/5	4.29
1882	412,001,683	230/10	241,477,156	135/3	767,899,570	430/2	4.32
1883	425,603,932	236/7	239,829,744	133/3	784,921,312	436/1	4.80
1884	389,774,549	214/9	232,927,575	128/4	801,464,367	441/7	4.68
1885	373,834,314	204/4	213,031,407	116/5	815,858,055	446/-	4.04
1886	349,381,087	188/10	212,363,995	114/9	828,344,254	447/9	3.94
1887	361,935,006	193/0	221,398,440	118/1	840,000,000	448/	..
1888	386,582,026	203/6	233,733,937	123/0	850,000,000	447/5	..

Estimated.

TABLE, SHOWING THE CONSUMPTION OR QUANTITY RETAINED FOR
MANUFACTURING PURPOSES OF THE LEADING ARTICLES
OF COMMERCE, AND OTHER STATISTICS OF THE
UNITED KINGDOM.

FOR TWENTY YEARS, 1869-1888.

Compiled by Francis Reid & Co., Brokers, Liverpool.

Year.	DECLARED VALUE OF GOLD, SILVER, AND SPECIE.				BANK INTER- EST.	INCOME TAX.	
	Imported.	Per Head.	Exported.	Per Head.		Nett Amount Assessed fo Property and Profits.	Per Head.
	£		£		Annual Average percent		
1869	20,500,991	13/4	16,391,999	10/8	3.20	389,421,002	253/3
1870	29,455,668	18/11	18,334,450	12/2	3.04	398,222,811	256/1
1871	38,140,327	24/3	33,760,671	21/5	2.88	419,850,798	266/7
1872	29,505,319	18/7	30,335,861	19/1	4.10	434,802,952	271/9
1873	33,454,724	20/11	28,899,285	18/1	4.79	453,585,000	283/6
1874	30,380,268	18/10	22,853,593	14/2	3.70	481,002,000	298/9
1875	33,264,789	20/6	27,625,042	17/7	3.24	498,260,040	307/7
1876	37,057,353	22/8	29,464,082	18/0	2.61	503,676,578	308/7
1877	37,162,534	22/6	39,798,119	24/1	2.88	490,344,906	297/2
1878	32,421,490	19/6	26,686,546	16/1	3.77	493,598,158	297/4
1879	24,065,656	14/4	28,609,912	17/1	2.51	490,425,774	292/9
1880	16,287,964	9/7	18,889,503	11/1	2.76	486,077,028	285/11
1881	16,864,918	9/7	22,502,819	12/9	3.48	490,966,686	278/2
1882	23,620,579	13/3	20,589,258	11/9	4.16	504,158,462	282/5
1883	17,201,311	9/7	16,414,211	9/1	3.58	519,435,375	288/7
1884	20,321,853	11/2	21,909,222	12/1	2.95	531,129,500	292/7
1885	22,751,720	12/5	21,783,105	11/11	2.92	530,480,682	289/10
1886	20,863,895	11/3	20,957,405	11/4	3.04	529,413,000	286/2
1887	17,765,315	9/6	17,131,018	9/2	3.34	525,422,339	280/3
1888	22,064,198	11/7	22,559,571	11/10	3.30	540,000,000 Estimated.	284/2

WEEKLY STATEMENT OF COMPARATIVE PRICES OF RAW

For the last Fifty-two Weeks, compared

	German Beetroot 88 o/o Prompt, free on board.						French Crystals, No. 3, f.o.b.			West India, Good Brown.			Java afloat, No. 15 and 16.		
	1888.	1887.	1886.	1888.	1887.	1886.	1888.	1887.	1886.	1888.	1887.	1886.	1888.	1887.	1886.
Jan. 6.	15 9	16 -	11 3	11 1/2	15 7 1/2	15 9	18 6	13 9	18 -	15 -	10 9	14 9	17 6	13 7 1/2	17 9
13.	15 6	15 1/2	11 1 1/2		14 9		18 3	13 9	17 6	14 6	10 9	14 3	17 3	13 4 1/2	16 9
20.	14 1 1/2		11 1/2	11 1 1/2	15 -	14 7 1/2	17 6	13 9	17 6	14 -	10 9	14 3	16 6	13 6	16 1/2
27.	14 6	14 7 1/2	11 1/2	11 -	14 -		17 3	13 9	17 -	14 -	10 9	14 -	16 1/2	13 6	16 6
Feb. 3.	14 6	14 1 1/2	11 -	10 7 1/2	13 9	14 -	17 -	13 9	16 9	13 9	10 9	14 -	16 1/2	13 6	16 -
10.	14 7 1/2		10 9		13 7 1/2		16 9	13 9	16 9	13 6	10 9	14 -	15 9	13 4 1/2	15 9
17.	13 10 1/2	14 1 1/2	10 9		12 6	12 9	16 3	13 6	16 -	13 -	10 9	13 3	15 3	13 5	15 -
24.	14 1/2	14 6	10 6		13 3	12 10 1/2	16 1/2	13 6	16 -	13 -	10 6	12 9	15 9	13 -	15 6
March 2.	14 6	14 7 1/2	10 7 1/2		13 1 1/2	13 3	16 6	13 6	15 9	13 -	10 6	13 -	15 9	12 9	15 6
9.	14 1 1/2	14 6	10 10 1/2	10 9		12 10 1/2	16 6	13 6	15 9	12 9	10 6	12 9	15 9	13 1/2	15 6
16.	11 1 1/2	14 7 1/2	10 9		12 4 1/2		16 9	13 6	15 6	13 -	10 6	12 6	15 6	13 3	14 6
23.	14 1 1/2		10 1/2	11 -	12 6		16 9	13 6	15 3	13 -	10 6	12 6	15 9	13 6	14 9
30.	14 1 1/2	14 -	11 3	11 1/2	12 3		16 9	13 7 1/2	15 3	13 -	10 6	12 6	15 7 1/2	13 6	15 -
April 6.	13 9	13 10 1/2	11 1 1/2		12 7 1/2	12 9	16 9	13 9	15 9	12 9	10 6	12 9	15 7 1/2	13 6	15 -
13.	14 1 1/2	15 1 1/2	11 7 1/2		13 -	13 1 1/2	16 9	13 10 1/2	15 9	12 9	10 9	12 9	15 7 1/2	13 9	15 6
20.	13 1 1/2	14 9	11 9		13 6		16 9	13 9	16 -	12 9	10 9	13 -	16 6	13 7 1/2	15 9
27.	13 1 1/2	14 1/2	11 7 1/2		13 9	13 1 1/2	16 6	13 7 1/2	16 -	12 6	10 9	13 -	15 7 1/2	13 7 1/2	15 9
May 4.	13 -	13 3	11 1 1/2	11 10 1/2	13 9	13 1 1/2	16 6	13 6	15 9	11 9	10 9	12 9	15 6	13 7 1/2	15 6
11.	12 9	14 1 1/2	11 9	11 10 1/2	12 9	12 7 1/2	16 1/2	13 6	15 6	12 -	10 9	12 9	15 1/2	14 6	15 -
18.	13 -	12 9	12 -	11 10 1/2	12 -		16 1/2	13 6	15 3	11 9	10 9	12 -	15 1/2	13 6	14 3
25.	13 -	13 1 1/2	11 10 1/2	12 -	11 9		16 1/2	13 6	14 9	11 9	10 9	11 9	15 1/2	13 3	14 -
June 1.	12 10 1/2	13 -	11 6	11 7 1/2	11 1 1/2		16 1/2	13 6	14 3	11 9	10 9	11 9	15 1/2	13 1/2	13 6
8.	13 1 1/2	13 1 1/2	11 9	11 10 1/2	6 6		16 6	13 1/2	13 9	11 9	10 6	11 -	15 7 1/2	13 6	13 3
15.	13 9	13 6	12 -	12 9	10 10 1/2		16 9	13 7 1/2	14 -	12 -	10 9	11 -	15 7 1/2	13 7 1/2	14 1/2
22.	13 9		12 3	13 -	11 1 1/2	10 10 1/2	16 9	14 3	14 3	12 -	11 -	11 3	16 7 1/2	13 10 1/2	13 6
29.	13 10 1/2		12 7 1/2	12 10 1/2	11 1 1/2		17 -	13 10 1/2	14 6	12 3	11 -	11 8	16 10 1/2	13 10 1/2	13 6
July 6.	14 -		12 10 1/2	13 1/2	11 3	11 4 1/2	17 -	13 10 1/2	14 3	12 3	11 -	11 3	15 10 1/2	13 10 1/2	13 7 1/2
13.	11 7 1/2	14 6	13 6	12 7 1/2	11 7 1/2		17 -	14 -	14 6	12 3	11 -	11 3	16 -	13 10 1/2	17 7 1/2
20.	14 6		13 -	12 7 1/2	11 3		17 -	14 1 1/2	14 6	12 3	11 -	11 -	16 -	13 9	13 6
27.	14 -		12 6		11 3	11 4 1/2	17 -	14 1 1/2	14 3	12 -	11 -	11 -	15 9	13 9	13 1/2
Aug. 3.	13 10 1/2		12 4 1/2	12 9	11 -	10 10 1/2	17 -	14 1 1/2	13 9	12 -	11 -	11 -	15 9	13 10 1/2	13 3
10.	13 10 1/2	14 2	12 6		11 -	11 1 1/2	17 3	14 -	13 4 1/2	12 3	11 3	11 -	16 -	13 10 1/2	13 -
17.	14 1/2	14 3	12 7 1/2	12 9	11 3	11 1 1/2	17 3	14 -	13 4 1/2	12 6	11 3	11 -	16 1/2	14 -	12 9
24.	14 1/2		12 6		11 1 1/2	11 -	17 3	14 1 1/2	13 4 1/2	12 9	11 3	10 9	16 3	14 1 1/2	13 -
31.	14 7 1/2	14 1/2	12 6	12 7 1/2	11 -	10 10 1/2	17 3	14 1/2	13 4 1/2	12 9	11 3	10 9	16 3	14 3	13 -
Sept. 7.	14 3	14 7 1/2	12 6	12 7 1/2	11 1 1/2	11 3	17 3	14 6	13 6	12 9	11 3	10 9	16 6	14 3	13 8
14.	14 6	14 1/2	12 7 1/2	12 6	11 6	12 -	17 -	14 6	13 6	12 9	11 3	11 -	16 6	14 3	13 9
21.	14 9	15 -	11 9	11 7 1/2	12 -	11 9	16 9	14 6	14 -	12 9	11 3	11 -	16 6	14 -	14 3
28.	14 6	14 -	11 7 1/2	11 10 1/2	11 9	11 1 1/2	16 3	15 -	13 9	12 9	11 3	11 -	16 6	13 9	14 3
Oct. 5.	13 6		11 10 1/2	12 -	11 -	10 10 1/2	15 9	15 3	13 3	12 6	11 6	10 9	16 -	14 -	13 9
12.	13 3		12 -	11 10 1/2	10 9		15 6	14 6	13 -	12 6	11 3	10 9	16 -	14 -	13 6
19.	13 3	13 6	11 10 1/2	12 1 1/2	10 9		15 9	14 6	13 -	12 6	11 6	10 9	16 -	14 1 1/2	13 3
26.	13 3	13 1 1/2	12 6	12 1/2	10 3	10 1/2	15 9	14 7 1/2	12 9	12 6	12 -	10 9	16 -	14 6	13 1 1/2
Nov. 2.	12 9	12 6	12 6	12 7 1/2	10 1 1/2	10 3	15 9	15 -	12 9	12 6	12 6	10 6	16 -	14 10 1/2	13 1 1/2
9.	12 9	13 -	13 4 1/2	13 7 1/2	10 6	10 7 1/2	15 9	16 -	13 -	12 6	13 -	10 6	16 -	16 -	13 3
16.	13 1 1/2	13 3	13 10 1/2	13 9	10 10 1/2	10 7 1/2	15 9	16 3	13 6	12 9	13 3	10 9	16 6	16 6	13 6
23.	13 6	13 7 1/2	14 1/2	13 10 1/2	10 9		16 -	16 6	13 4 1/2	13 -	13 3	10 9	17 -	16 3	13 1/2
30.	13 3	13 6	14 3	14 6	10 9	10 10 1/2	16 1 1/2	17 -	13 3	13 3	13 6	10 9	17 -	16 9	13 3
Dec. 7.	14 3	14 1/2	15 6	15 3	11 6	11 1 1/2	16 9	17 9	13 1/2	13 6	14 -	10 9	17 -	17 1/2	13 9
14.	13 10 1/2	14 1 1/2	15 -	15 3	11 6	11 -	16 9	17 9	13 6	13 6	14 -	10 9	17 -	17 1/2	13 9
21.	13 9	14 -	15 6	16 -	11 -		16 1/2	18 -	13 6	13 6	14 6	10 9	17 -	17 6	13 6
28.	13 10 1/2		16 3	16 1 1/2	11 -		16 1/2	18 6	13 6	13 6	15 -	10 9	17 -	18 -	13 6

AND REFINED SUGAR FROM JANUARY TO DECEMBER, 1888, 1887, & 1886.

with those of the two previous years.

	Tate's Cubes.			Martineau's Titlers.			Say's Loaves, f.o.b.			Lebaudy Loaves, f.o.b.				
	1888.	1887.	1886.	1888.	1887.	1886.	1888.	1887.	1886.	1888.	1887.	1886.		
Jan. 6..	22/3	19/-	23/-	21/-	21/3	17/-	21/3	21/6	19/9	15/6	—	19/6	15/-	—
13..	22/-	19/-	23/-	20/9	21/-	17/-	21/3	19/6	19/6	—	—	19/6	—	19/6
20..	21/6	19/3	22/6	20/6	—	17/3	21/-	19/-	19/-	—	—	19/-	15/3	—
27..	21/6	19/-	22/-	20/-	20/3	17/3	20/6	—	15/6	—	—	18/6	15/3	18/-
Feb. 3..	21/3	19/-	21/9	20/-	—	17/3	20/3	—	—	—	—	—	—	18/-
10..	21/-	18/9	21/6	19/6	19/9	17/-	20/3	18/-	—	—	—	17/9	15/-	18/-
17..	20/9	18/9	21/-	19/-	19/3	17/-	19/9	17/3	15/3	—	—	17/3	—	—
24..	20/9	18/9	21/-	19/-	19/3	17/-	19/6	17/9	—	—	—	17/4½	—	17/6
March 2..	20/9	18/9	21/-	19/3	—	17/-	19/3	18/3	—	—	—	17/7½	14/9	—
9..	20/9	18/9	21/-	19/3	—	17/-	19/3	18/-	—	17/6	—	—	14/9	—
16..	20/6	18/9	20/9	19/-	—	17/-	19/-	—	—	—	—	—	14/9	17/-
23..	20/6	18/9	20/9	19/3	—	17/-	19/-	18/-	—	17/3	—	—	14/9	17/-
30..	20/6	18/9	20/9	19/3	—	17/-	19/-	17/9	15/-	—	—	—	14/9	—
April 6..	20/6	19/-	21/-	19/3	—	17/-	19/-	17/6	—	17/3	—	—	—	17/-
13..	20/6	19/3	21/3	19/3	19/6	17/-	19/3	17/9	—	17/6	17/3	—	—	17/3
20..	20/9	19/-	21/6	19/6	—	17/-	19/3	17/9	—	17/9	17/6	—	—	17/6
27..	20/9	19/-	21/9	19/6	—	17/-	19/6	17/6	—	18/-	—	—	—	—
May 4..	20/9	18/9	21/6	19/3	—	17/-	19/6	17/6	15/-	—	—	17/3	14/9	—
11..	20/6	19/-	21/-	19/-	19/3	17/-	19/3	17/6	—	—	—	17/3	14/9	17/3
18..	20/6	18/9	20/6	19/-	19/3	17/-	19/-	17/6	—	—	—	17/3	14/10½	17/3
25..	20/6	18/9	20/6	19/-	19/3	17/-	18/9	17/6	—	17/3	17/9	14/10½	—	—
June 1..	20/6	18/9	20/-	19/-	19/3	17/-	19/3	17/9	—	—	—	17/4½	14/10½	—
8..	20/6	18/9	20/-	19/6	19/9	17/-	18/-	17/9	—	18/6	17/4½	14/10½	—	—
15..	21/-	19/-	20/-	19/9	—	17/-	17/9	18/-	—	18/6	17/9	14/10½	18/-	—
22..	21/-	19/3	20/-	19/9	—	17/-	18/-	18/-	15/3	—	17/10½	15/-	16/-	—
29..	21/3	19/3	20/3	20/-	—	17/-	18/-	18/3	15/-	—	18/-	—	16/-	—
July 6..	21/-	19/3	20/3	20/-	—	17/3	18/3	18/3	15/-	18/6	18/-	—	16/-	—
13..	21/-	19/3	20/3	20/-	17/6	17/3	18/3	18/6	—	—	18/3	15/-	16/-	—
20..	21/-	19/3	20/3	20/3	17/3	17/6	18/3	18/9	15/-	—	18/3	—	16/3	—
27..	21/-	19/3	20/-	20/3	17/3	17/6	18/3	18/9	15/-	—	—	—	16/-	—
Aug. 3..	21/-	19/-	20/-	20/3	17/3	17/6	18/3	18/6	15/-	—	—	—	16/-	—
10..	21/6	19/-	20/-	20/3	17/3	17/6	18/3	18/6	15/-	—	18/1½	15/1½	16/-	—
17..	21/9	19/-	20/-	20/6	17/6	—	18/3	18/6	15/3	—	—	15/1½	16/-	—
24..	22/3	19/6	20/-	20/6	17/9	—	18/3	18/9	15/4½	—	18/6	15/3	15/9	—
31..	22/3	19/6	20/-	20/3	17/9	—	18/3	19/-	—	—	—	15/6	15/6	—
Sept. 7..	21/9	19/6	20/-	20/-	20/3	17/9	18/-	18/3	15/6	16/6	—	15/3	15/6	—
14..	21/6	19/6	20/3	20/-	—	17/9	18/3	19/-	—	—	—	15/9	16/-	—
21..	21/6	19/3	20/3	20/-	17/6	17/9	18/3	18/9	15/6	—	18/6	—	16/-	—
28..	21/6	19/-	20/-	19/9	17/6	—	18/3	18/6	—	—	—	—	15/6	—
Oct. 5..	21/-	19/3	20/-	19/6	—	17/6	18/3	18/3	15/6	—	18/-	—	15/6	—
12..	21/-	19/6	20/-	19/3	—	17/6	18/-	18/3	15/6	—	17/6	—	15/6	—
19..	21/6	19/9	20/-	19/3	—	17/6	18/-	18/9	15/9	—	17/6	—	15/6	—
26..	21/-	20/-	20/-	19/-	19/3	17/9	17/9	18/3	16/-	—	17/6	—	15/-	—
Nov. 2..	21/-	20/-	20/-	19/-	19/3	17/9	17/6	18/-	16/-	15/3	17/6	—	14/9	—
9..	21/-	21/-	19/6	19/-	19/3	19/-	17/6	18/-	17/3	15/-	17/4½	17/1½	14/9	—
16..	21/3	21/3	19/6	19/-	19/3	19/3	17/3	18/3	18/-	15/-	17/7½	17/1½	14/9	—
23..	21/3	21/-	19/6	19/3	—	19/-	17/6	18/6	18/-	—	17/9	17/7½	14/9	—
30..	21/6	21/6	19/6	19/3	—	19/6	17/3	18/6	18/3	—	18/-	17/9	14/9	—
Dec. 7..	22/-	22/-	19/6	19/6	20/-	17/3	18/9	18/9	15/6	18/-	18/9	15/-	—	—
14..	22/-	21/6	19/6	19/6	20/6	17/3	18/6	18/9	15/6	18/-	18/9	15/-	—	—
21..	21/9	22/-	19/6	19/6	20/6	17/3	18/6	19/-	15/6	18/-	19/-	—	—	—
28..	21/9	22/6	19/6	19/6	21/-	17/3	18/6	18/9	—	18/-	19/6	—	—	—

IMPORTS AND EXPORTS (UNITED KINGDOM) OF RAW AND REFINED SUGARS.

JANUARY 1ST TO DECEMBER 31ST, 1887-1888.

Board of Trade Returns.

IMPORTS.

RAW SUGARS.	QUANTITIES.		VALUE.	
	1887.	1888.	1887.	1888.
	Cwts.	Cwts.	£	£
Germany	7,573,636	5,320,106	4,488,678	3,495,698
Holland	408,404	283,549	231,020	182,577
Belgium	1,068,683	694,302	640,351	437,331
France	68,186	37,367	41,426	27,398
British West Indies & Guiana	2,148,245	2,140,438	1,557,883	1,725,522
British East Indies	853,663	1,006,913	410,072	483,865
China and Hong Kong	16,312	10,733	12,201	6,420
Mauritius	104,986	256,463	57,498	173,372
Spanish West India Islands	176,358	304,496	109,330	223,544
Brazil	865,281	2,267,225	476,603	1,425,784
Java	3,200,343	3,612,487	2,085,627	2,704,310
Philippine Islands	460,386	722,425	210,438	345,317
Peru	436,634	497,142	277,307	369,075
Other Countries	574,108	696,725	335,843	507,154
Total of Raw Sugars ...	17,955,225	17,850,371	10,934,277	12,107,367
Molasses	305,538	346,025	101,822	109,485
Total Sugar and Molasses	....	....	11,036,099	12,216,852
REFINED SUGARS.				
Germany	2,834,924	3,177,340	2,204,506	2,768,246
Holland	1,503,522	1,426,276	1,186,828	1,290,654
Belgium	216,717	203,888	181,184	193,316
France	1,551,435	1,570,237	1,189,280	1,376,741
United States	782,552	41,628	627,798	38,960
Other Countries	121,612*	470,429*	88,801	375,559
Total of Refined	7,010,762	6,889,848	5,478,457	6,043,476
EXPORTS.—REFINED SUGARS.				
	Cwts.	Cwts.	£	£
Sweden and Norway	79,162	81,751	57,253	68,136
Denmark	112,319	102,725	65,639	75,472
Holland	78,240	92,665	52,993	66,798
Belgium	40,991	31,734	25,270	21,569
France	33,017	7,393	21,204	5,186
Portugal, Azores, & Madeira	33,513	79,196	50,684	56,603
Italy	99,458	93,061	65,444	68,860
Other Countries	178,191	193,155	196,527	150,502
Total of Refined	704,891	681,680	465,013	513,126

* Entirely from Russia.

IMPORTS OF FOREIGN REFINED SUGAR.

The British Sugar Refiners' Committee furnish us with the following figures, giving the imports of foreign refined sugar for the month of December, 1888, compared with the corresponding months of the two preceding years, and the average monthly imports for the year compared with those of 1885, 1886, and 1887, distinguishing the quantities of "Lumps and Leaves" from "other sorts," and giving the separate imports from each country:—

Countries from which Sugar has been imported.	" LUMPS AND LOAVES."				" OTHER SORTS," Including Crushed Loaf, Granulated, Crystallized, &c.				TOTAL.			
	Monthly Average.		Dec.	Dec.	Monthly Average.		Dec.	Dec.	Monthly Average.		Dec.	Dec.
	1885	1886	1887	1888	1885	1886	1887	1888	1885	1886	1887	1888
France.....	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
	1697	1462	1363	1686	1787	1451	1792		2000	6102	6511	5185
Holland	3848	3508	3750	3247	2907	3818	3943		5320	4836	6263	4566
Germany & Austria ..	808	990	1347	1510	1552	1390	3277		4070	7624	11810	13239
Belgium	189	344	592	622	225	508	1012		309	457	900	849
United States	707	854	454	8	59	..	..		9570	5932	3258	165
Russia .....	..	..	3	..	..	..	..		875	3112	455	1959
Other Countries	1	..	..	1	..	..	..		25	9	15	3
Total	7160	7158	7539	7094	6530	7267	10021		22345	26520	29164	28998

SUGAR STATISTICS—GREAT BRITAIN.

FOR THE FOUR PRINCIPAL PORTS.

To JANUARY , 1889 AND 1888. IN THOUSANDS OF TONS, TO
THE NEAREST THOUSAND.

	STOCKS.		DELIVERIES.		IMPORTS.	
	1889.	1888.	1889.	1888.	1889.	1888.
London	37 ..	59	12 ..	19	18 ..	24
Liverpool ..	85 ..	89	22 ..	21	13 ..	26
Bristol	3 ..	5	6 ..	5	7 ..	6
Clyde	35 ..	45	13 ..	19	24 ..	20
Total ..	160	198	53	64	62	76
	Decrease.. 38		Decrease.. 11		Increase.. 14	

The above figures do not include Hull, Leith, &c., of which there are no published returns.

SUGAR STATISTICS—UNITED STATES.

FOR THE FOUR PORTS—NEW YORK, BOSTON, PHILADELPHIA,
AND BALTIMORE,—1888, 1887, 1886. IN TONS.

	Imp'r's Stocks on Ist.			Deliveries.			Imports.		
	1888.	1887.	1886.	1888.	1887.	1886.	1888.	1887.	1886.
January ..	47798	102279	57328	67682	74708	65313	76821	66505	51509
February..	56937	94076	43524	71006	77184	89136	87447	71176	106991
March	73378	88088	61379	81328	118939	96487	103235	113209	114301
April	95285	82358	79193	89086	136470	89791	108558	165224	112801
May	114757	111112	102203	95999	126116	103176	122475	172344	140791
June	141233	157340	139818	118209	91476	107671	120472	118868	123800
July	143496	184732	155947	122194	96792	115006	90166	82323	134549
August....	111468	170263	175490	111965	104914	112044	81971	88125	97525
September.	81474	153474	160971	102276	98182	102055	77670	57858	87601
October ..	56868	113150	146517	71334	100001	79273	64516	58670	53748
November.	50000	71819	120992	56189	73185	73163	43527	58188	67339
December.	37338	56822	115168	112415	67175	83021	107331	58151	70132
Total Tons.	—	—	—	1099733	1165122	1116136	1084189	1110641	1161087

STOCKS OF SUGAR IN THE CHIEF MARKETS OF EUROPE ON THE
31ST DECEMBER, FOR THREE YEARS, IN THOUSANDS
OF TONS, TO THE NEAREST THOUSAND.

Great Britain.	France.	Holland	German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1888.	TOTAL 1887.	TOTAL 1886.
152	*210	41	*295	*170	20	888	973	1138

*Estimate.

CONSUMPTION OF SUGAR IN EUROPE FOR THREE YEARS, ENDING
31ST DECEMBER, IN THOUSANDS OF TONS, TO THE
NEAREST THOUSAND.

Great Britain.	France.	Holland	German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1888.	TOTAL 1887.	TOTAL 1886.
1232	493	38	444	223	347	2777	2735	2559

ESTIMATED CROP OF BEET ROOT SUGAR ON THE CONTINENT OF EUROPE
FOR THE PRESENT CAMPAIGN, COMPARED WITH THE ACTUAL CROP,
OF THE THREE PREVIOUS CAMPAIGNS.

(From Licht's Monthly Circular.)

	1888-89.	1887-88.	1886-87.	1885-86.
	Tons.	Tons.	Tons.	Tons.
France.....	475,000 ..	392,824 ..	485,739 ..	298,407
German Empire ..	975,000 ..	942,441 ..	1,012,968 ..	838,131
Austro-Hungary..	575,000 ..	408,616 ..	523,059 ..	377,032
Russia and Poland.	510,000 ..	441,342 ..	487,460 ..	537,820
Belgium	137,500 ..	135,000 ..	132,570 ..	88,421
Holland	45,000 ..	39,280 ..	36,098 ..	28,818
Other Countries..	60,500 ..	56,050 ..	56,050 ..	55,000
Total....	2,778,000	2,415,553	2,733,944	2,223,629

Mr. Licht's present estimate shows a reduction upon his previous one of 30,000 tons, namely: 15,000 for France, and 15,000 for Russia.

Mr. Gorz's estimate for present crop, 1888-9 is 2,580,000 tons, or 198,000 tons less than Mr. Licht's.

STATE AND PROSPECTS OF THE ENGLISH SUGAR MARKET.

The sugar market during the past month has been dull. The supplies of foreign refined are large, and continue to prevent any improvement in prices. German beet 88½ f.o.b. has fallen about 3d. per cwt.; the latest quotation for February is 13/7½ per cwt. Next crop, for October—December, is quoted at 12, 9. Still the feeling is one of confidence in present values, and that prices for the next two or three months are more likely to rise than to fall.

Mr. Licht's latest estimate, in which he reduces the total by 30,000 tons, has had little effect upon the market.

The imports of foreign refined for December were 59,889 tons, or more than 20,000 tons in excess of the corresponding month in 1887.

The deliveries into the United Kingdom (four principal ports) from 1st to 26th January were 53,375 tons, against 64,009 tons in 1888. The imports for same dates were 61,479 tons, against 76,291 tons.

The stocks in the United Kingdom on 26th January were 159,826 tons, against 197,507 tons last year.

Present quotations for the standard qualities, as under, are:—

	FLOATING.	Last Month.
Porto Rico, fair to good Refining	13/3 to 14/6	against 13/6 to 14/9.
Cuba Centrifugals, 97% polarization	16/3	„ 16/3
Cuba, fair to good Refining	13/6 to 14/-	„ 13/9 to 14/3.
Java, No. 14 to 15 D.S.	16/6 to 16/9	„ 16/9 to 17/-.
British West India, fair brown	13/-	„ 13/-
Bahia, low to middling brown	10/9 to 11/6	„ 10/9 to 11/6.
„ Nos. 8 to 9	12/3 to 13/-	„ 12/3 to 13/-.
Peruams, regular to superior Americans..	11/3 to 13/9	„ 11/3 to 13/9.
	LANDED.	Last Month.
Madras Cane Jaggery	10/3 to 10/6	against 10/6 to 10/9.
Manila Cebu and Ilo Ilo	10/- to 11/-	„ 10/- to 10/9.
Paris Loaves, f.o.b.	17/9 to 18/-	against 18/- to 18 6.
Titlers	19/6	„ 19/6
Tate's Cubes	21/6	„ 21/-
Beetroot, German, 88½ f.o.b.	13/7½	„ 14/-

THE SUGAR CANE.

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 The writers alone are responsible for their statements.

N.B.—All communications to be addressed, and Cheques and P.O. Orders made payable to HENRY THORP, Ducie Chambers, 57, Market Street, Manchester.

For Scale of Charges for Advertisements, see page xi.

For Table of Contents, see page iii.

In the short notice we gave in the last month's *Sugar Cane*, page 62, of "The Gibbs' Cylinder Dryers," a misprint occurs in line 13.—40 inch by 5 inch, should read 40 feet by 5 feet.

We are glad to note that a first-class award has been gained by Messrs. Aitken, McNeil & Co., Colonial Iron Works, Govan, Glasgow, for their model of Messrs. Thomson & Black's PATENT FIVE-ROLLER SUGAR CANE MILL, shown at the Melbourne Exhibition.

Sir Henry A. Blake, the newly-appointed Governor of Jamaica, has appointed Lord George Fitzgerald to be his private secretary, and Lieutenant C. M. Murrough Kavanagh, 10th Hussars, to be his aide-de-camp. Sir Henry left for Jamaica on the 21st ult.

Sir Henry Wylie Norman, the new Governor General of Queensland, paid a long visit to the Colonial Office, on the 18th ultimo, to make preparations for taking up his new position. Sir Henry will leave London for Brisbane, on March 5th, with his family and staff.

It is stated that the Colonial Institute has resolved to merge itself in the new Imperial Institute. At all events, this is the recommendation of the Council, and it is more than probable that it will be agreed to by the members, who number between three and four thousand.

We learn from *The Queenslander* that a Commission has been appointed to inquire into the general condition of the sugar industry in that colony, which has given rise to some speculation as to the results of the investigation and the recommendations which the Commission are likely to make. They are required to report upon the "causes which have led to the present languishing condition of the industry throughout the colony, the best means to be adopted for reviving and maintaining its prosperity, and generally upon the prospects of tropical agriculture in Queensland." The gentlemen appointed are Messrs. Groom and Cowley, and Mr. H. E. King.

In the Queen's Speech, which was read on the 21st ult., upon the reassembling of Parliament, a short allusion was made to the Sugar Convention, as follows:—

"Legislative provision will be necessary for executing the Convention into which I have entered for the suppression of bounties on the exportation of sugar."

Baron H. DE WORMS, the following evening, in reply to a question put by Mr. Picton, the member for Leicester, said: As to the Sugar Bounties Convention, he would remind the hon. member that a resolution in its favour had been signed by over 423,000 workmen, representing all the trade unions of this country; and if this was, as had been represented, "class legislation"—then the classes and the masses were identical. Did the hon. member, as a man of business, suppose that a non-subsidised producer at home could compete with a subsidised producer abroad? It might seem paradoxical, but he (Baron H. de Worms) maintained that they might buy cheap things too cheaply. Not only this Government, but successive Governments for nearly a quarter of a century, had felt that the bounty system was absolutely indefensible, because it was an entire delusion that the bounties benefited anyone but the manufacturers who received them. The only result of the abolition of bounties would be that those manufacturers would have to content themselves with smaller and legitimate profits.

Sir L. PLAYFAIR asked for an assurance from the Government that ample opportunity would be given for the discussion of the Sugar Bounties Convention. He thought the Convention was a bad one, that it was impracticable, that it would bring us into collision with other nations, and that it would materially injure the working classes.

Mr. ALLISON condemned the Convention on the ground that it was absolutely hostile to free trade, and said the President of the Board of Trade had been the mere tool and dupe of those with whom he had entered into negotiation.

Mr. T. SUTHERLAND, Greenock, said that by the removal of the sugar bounties trade would be stimulated not only in the West Indies but also in the great Australian Colonies. The action of the Government

was entirely in the interest of free trade, as well as in the interest of the industrial centres and of the great consuming classes of the country generally.

In a former number, we alluded to the "snatch victory" obtained by the Fair Traders at the meeting of the Manchester Chamber of Commerce, on 19th December last, On the 8th ultimo, the Annual Meeting of the Chamber took place, when the president, referring to this "Fair Trade" resolution, said, "it was a resolution so entirely opposed to the traditions of the Chamber and to a resolution passed in April, 1887, that the Board felt they were bound to adopt one of two courses—either to call a meeting for further discussion or resign. They were quite unanimous on the position they were bound to take up, but they felt that if they called a special meeting the probability was that only ten or twenty per cent. of members would attend. A vote taken that way was bound to be unsatisfactory. The Board held a meeting at which a resolution was passed re-affirming the opinion that the Chamber adhered to its views on Free Trade. A resolution was also passed by the Board to send circulars to every subscriber, asking each whether or not he approved of the resolution adopted by the directors. They were not quite unanimous in this decision. Some members of the Board thought it was an unusual course, and that they were creating a precedent which it was not desirable to create; but the majority came to their conclusion, because they felt that on a question of such importance they were bound to go out of their way. He was glad to hear from directors who were not present the opinion that they had done the right thing, and that if they had created a precedent they had done nothing extraordinary or gone beyond the rules which regulated the conduct of the Chamber. As had been extensively announced by the newspapers, 1,004 circulars were sent out. These brought 621 replies, of which 37 were invalid, 397 approved, and 187 disapproved of the proceedings of the Board. In the case of firms exercising their right of two votes this would count for 556 and 221 votes respectively. He thought they had now ascertained that the subscribers had approved of their conduct, and that a large majority held to the principles of Free Trade."

President Cleveland has approved of the Bill for creating a Department of Agriculture, and has nominated Mr. Norman Colman to the post of Secretary.

We have received *Bulletin* No. 19 of the Louisiana State Experiment Station, containing Dr. W. C. Stubbs' report on sorghum, field, laboratory, and sugar house results, and on the diffusion process. The following are the conclusions arrived at:—

"While the work of the present season has not been at all favourable to the manufacture of sugar from sorghum, in Louisiana, yet the

application of diffusion to the extraction of juice both from sorghum and sugar cane has been clearly demonstrated. But this has been a most disastrous year for sorghum in Louisiana. Could a fair quality of sorghum have been worked, it is believed that fully 100 to 125 pounds of sugar to the ton would have been easily obtained. In 1886, the Early Orange variety gave 13 per cent. sucrose; in 1887, 10·5 per cent., and with small glucose ratios each year. This season it gave only 7 per cent. sucrose, and with a glucose ratio of about 50. Even with this composition, 31½ pounds sugar per ton was obtained. What would have been the result had diffusion been applied to the sorghum of 1886?

"However, the stations will repeat again the experiments next year, with more promise of success."

The *Revue Scientifique*, of Paris, devotes an article to the manufacture of paper from cane fibre, which has long been known to be possible, and to which attention has been called by the fact of a number of samples of excellent paper, so manufactured, being exhibited at New Orleans. The *Revue Scientifique* expresses surprise that in face of the great demand for cheap materials for paper making, and the complaints of insufficient profits on cane planting, attention should not have been turned in this direction; stating that 500 tons of cane would produce 10 tons of paper, at a cost of about 8s. 10d. per cwt. The writer of the article seems totally to forget that the bagasse is required for fuel, and if used for paper making, would have to be replaced by some much more expensive combustible.

Reports continue to reach us of the establishment of new beet sugar factories. In Germany two new factories are to be set up in the neighbourhood of *Nordhausen*, the capital being already subscribed, and they will commence working next autumn. Another is projected at *Goldbeck*, in the *Altmark*, and a large one is to be commenced at *Wismar* next spring.

We hear that Spain is about to follow Portugal (see last month's *Sugar Cane*, page 61,) in encouraging the cultivation of the sugar beet for manufacturing purposes. It must not be forgotten that although first-class beets can no doubt be produced in both these countries, the same conditions exist in Italy, where, however, the experience of about twenty years has up to now only resulted, after notable failures and losses, in the production (in 1886-87) of some 180 tons of sugar.

At *Mezőhegyes* (Hungary), a new factory, to work up 600,000 quintals of beets during the campaign, is to be erected, and will commence operations in the autumn.

From the *Deutsche Zuckerindustrie* we learn that a company was formed last December in Amsterdam, under the style of "Cultuur Maatschappij Rust en Werk," with a capital of Fl.270,000 (£22,500), to work the plantation of that name in Surinam.

The great disparity in the dividends declared by the German Sugar Companies, must have surprised many; for the differences seem greater than can be accounted for by any advantages which one company may obtain over another in the purchase of the beets, or in the sales of sugar, or to the superior method of manufacture. A writer in the *Deutsche Zuckerindustrie*, who signs himself Dr. B., partly explains the difference. He says:—

Our sugar manufactories are inseparably connected with the agricultural interest; they form only one link in the chain of agricultural working. The farmers cultivate beets, in order to make up for the deficit on their other crops. To this end, not only the money received for the beets, but *also the greater part of the so-called dividends*, is necessary in order to secure a satisfactory profit to the farmers; but only manufactories working under favourable conditions attain this aim, the greater part fail to do so. In spite of this we hear dividends spoken of as if they were a surplusage from the factories, which was going quietly into the pockets of the farmers as a net profit.

The question is then primarily—"How does the final balance-sheet of the farmer show up after these dividends have been included?" Unfortunately this question is totally ignored in the midst of the excitement caused by the founding of several new sugar factories, and for this reason we can only prophesy for these establishments a longer or shorter period of steady decay, unless they are very soundly constituted. This is the damage done by these dividends, which would not have been so great if the opinions and calculations of the agriculturists with regard to the results of the factories were more publicly known.

LOUISIANA.

RECORD OF A DOUBLE MILL.

Mr. Thompson send us the following cutting from the *New Orleans City Item* of January 29th:—

“About a month ago Mr. Dan Thompson of “Calumet” plantation informed *The Item* that in his opinion he had obtained a yield of over 200lbs. of sugar to the ton of cane; but he did not wish to give publicity to the statement as their might be some mistake.

Meeting Mr. Thompson at the St. Charles Hotel last night, *The Item* asked him if the fact was now sufficiently established for publication. “Yes,” said he, there is no doubt that I have made over 200lbs. of sugar to the ton of cane

AS THE AVERAGE FOR THE CROP,

but how much I can not say, as I shall not finish drying my wagon sugars for two weeks yet. When these are swung out and weighed I will give you the exact figures.”

The Item—“To what do you attribute this phenomenal yield? Was the cane extraordinarily rich in sucrose?”

Mr. Thompson—“No; there was not an unusual amount of sugar in the cane. But there was less glucose. I attribute the large yield to a lower glucose ratio, and to

MORE CAREFUL METHODS

in my sugar house work. When I give *The Item* the figures of the crop, I will also give an account of my sugar house work.”

Implicit reliance can be placed on the statement of Mr. Thompson. No sugar house in the State, not excepting Magnolia, does closer work than is done at Calumet. The greatest care is taken in weighing the cane, and the juice is scientifically followed from the double mill until it is turned out as *masse cuite*.

A yield of 200 pounds of sugar to the ton by the mill has been hitherto considered impossible. For this wonderful achievement Mr. Dan Thompson is entitled to great credit, although he will no doubt gladly share the credit with his talented son, Mr. Wibray J. Thompson, who devoted his time and energies to the sugar house, and by his scientific work accomplished the astonishing result.”

ELECTRIC SUGAR FRAUDS.

MRS. FRIEND AND OTHERS ARRESTED.

Telegraphic accounts of these arrests have appeared in several papers, but the account affording the most information is that given in the *Liverpool Daily Post*, which we reproduce:—

New York, February 18.

Mrs. Olive Friend, William and Emily Howard, and Gus and George Halstead, all persons who are wanted in connection with the Electric Sugar frauds, have arrived at Milan, Michigan, and have been lodged in gaol on criminal warrants. Unless they are released under the *Habeas Corpus*, they will be brought to New York this evening. William Howard has "squealed," and he states that the Electric Sugar Refinery was organised for swindling. He promises a big sensation when he reaches New York.

The fact that the "electric" gang had been indicted here in criminal proceedings was kept a secret. Lawson N. Fuller vows that the gang must give up the secret of their alleged process, or go to the State prison for obtaining money under false pretences. "I have taken up this prosecution," said Fuller, "to satisfy the stockholders who are not here, and also to vindicate myself. No man can swindle me and go unpunished. I tell you everything that can be done without malice and vindictiveness shall be done to bring those people to justice. I, for my part, will be content if they will tell me how they refined that sugar when they come here." On being interviewed in gaol, William Howard denounced the arrest as being without warrant. He was not interested in the company, and never held any stock except once, five or six years ago, when five shares of the old company were given to him, so that he might vote for Friend for some office, but he afterwards returned them to the company, and they paid him \$500. He had never held a dollar's worth of stock in the new company. At the time of Friend's death, and prior, he was employed by the company in superintending the building of machinery. After Friend's death Cotterill and Robertson came and induced him to remain and finish the work. He was paid \$50 a week for several months, and he was to have \$5,000 when the first demonstration was made, \$20,000 more within a month, and \$25,000 within six months. In his capacity as superintendent money was paid to him to pay for machinery and necessary articles. Neither Cotterill nor any of the stockholders ever inquired what this money

was paid for, and never were to ask the question, as the contract provided that they should not ask or attempt to find out any of the secrets of the concern. He denied that he received \$180,000 for the machinery and preparing the building. He had never received from the company more than \$20,000, and every dollar of this had been used for the purpose for which it was obtained. The machinery was expensive and complicated, and for maintaining secrecy each part was made at different places. All the *employés* about the factory were sworn to secrecy, signing an agreement to that effect, and were paid good wages. On this account Howard was to have received \$5,000 on his contract after the last demonstration, but he only received half that amount. This sum, apart from his wages, was the only money ever paid to him by the company. He charges that while there might have been some chicanery about the business, two, whom he names, were the head of the swindle. The whole scheme was originated by Professor Friend and one of these two for the purpose of swindling. Barrels and barrels of raw sugar would be sent to the factory, but every particle was still there, or was at the time he left. He threatens, when his lawyers will allow him, to make revelations that will surprise the public. He still alleges that there is a secret process connected with the refining that was not discovered when the factory was broken into. This secret is only known to Mrs. Friend, and the present procedure is denounced by Howard as a bluff to extort this secret from her.

Mrs. Friend, when interviewed, said: "I am not a particle afraid of the present aspect of the case, although I was greatly surprised at being arrested. I have been at my home in Milan for the past four weeks, and could easily have left the country; but I have done nothing criminal, and have not even received what my contract calls for. Since my husband died I have not had a single dollar from the company except an allowance of \$100 a month. I now have 5,250 shares of the company's stock. I never sold any of my stock. The company held 1,000 shares as working capital, and, not having enough to run on, I turned over 750 shares of mine to them. I have not received anything from them except what they paid for my husband's funeral expenses and some small debts amounting to \$1,100. In regard to the mortgages placed on my property, they are perfectly valid, and will stand in law. They were given for money borrowed when I saw there was going to be a legal fight. If I am compelled to go to New York, I shall contest this arrest to the end, and I feel sure of winning."

BANQUET TO BARON H. DE WORMS, M.P.,
AT LIVERPOOL.

On the 6th ult., Baron Henry De Worms, M.P. for East Toxteth, was entertained at a banquet by gentlemen connected with the sugar trade in Liverpool. There was a gathering of about two hundred, and among those present were Messrs. C. J. Crosfield, P. Harris, E. H. Harrison, A. Holt, J. Barrow, J. Heap, H. Coke, S. S. Parker, T. C. Edwards-Moss, M.P., the Hon. W. H. Cross, M.P., G. Martineau (London), A. Turner, A. Garnett, J. A. Willox, W. H. Tate, W. Bostock, J. Higson, H. Tate, junr., G. Behrend, H. Leitch, J. Harnden, J. H. Higson, B. Fletcher, W. Oulton, Lawrence A. J. Fairrie, J. W. Macfie, A. Mambre, Thomas Hadfield, A. Kirk, W. Steensstrand, Stewart Brown, G. Leyland, J. Fairrie, T. O. Easton, J. W. Strafford, A. L. Jones, D. J. Crosfield, A. Kirk, T. Gee, Stolterfoht, J. Reynolds, A. Wilson, W. Powell, E. Powell, C. P. Molineux, E. C. Leventon, Dare, J. J. Astley, Alty, H. Fernie, Crawford, O. Darbyshire, G. G. Macandrew, Sherlock, Anderson, Col. Macfie, J. Czarnikow, and others.

The CHAIRMAN (Mr. C. J. Crosfield), after a few introductory remarks in acknowledgment of Baron H. de Worm's great services in conducting the proceedings of the late International Sugar Congress, went on to say, in proposing the health of the guest of the evening, that they were met together without regard to politics; the gathering represented all shades of opinion. They were all under a debt of gratitude to Baron de Worms, who went to the bounty-giving countries and tried to smooth matters over. The convention he had attended had come to the conclusion that bounties should be abolished. But the Baron's work was not completed. He had still to go to Parliament and carry through a measure to this effect, and then they would be within a measurable distance of free trade in sugar. Such a condition of affairs had not existed within his memory, and they would all look forward to the carrying into effect the decision of the convention, which he hoped would give greater prosperity to the sugar trade. They had been constantly charged with being protectionists. He did not feel competent to go into that question fully, but he did feel that they would be neglecting their duty if they did not repudiate that idea in the strongest possible terms. It was difficult to discuss this matter with people of pre-

conceived notions, but he hoped the protectionist idea in connection with this movement would be set at rest. The Chancellor of the Exchequer, who was no mean authority on the subject of free trade, said the other day that part of his duty would be to defend the action of the Government in this matter, and part of his duty would be to see that the measure proposed did not offend against the doctrines of free trade. They had been charged with the desire to increase the cost of the necessities of life, but they had no such desire or intention.* The Chairman added that the only object of the English sugar refiners was to get such a profit as would repay them for their outlay and labour, and get a fair margin of profit.

BARON DE WORMS, who was received with great applause, said he felt very sincerely the compliment paid him by the present company, and that paid him by the Government in appointing him to carry out the mission in which they were interested. He had attended the international conference, and although he went there under great disadvantages, he believed that common sense prevailed over prejudices, and he believed also that the bounties given by other nations could not be buoyed up by any system of political economy. He found that in France and Germany some millions of money were devoted to the backing up of this sugar trade, and when he went to meet the representatives of France and Germany he was under this disadvantage, that they were prepared to proceed on these lines while he, as the representative of a Free Trade nation, could offer to them nothing but his own inducements to do away with what he considered an abominable system. The conference met in November, and he found that Spain and other countries were open to treat in this matter on the basis which he proposed. There was the subject of countervailing duties, and we, as a Free Trade country, could not enter into any arrangement infringing the principle of Free Trade. He felt justified in allowing other Powers to follow out their own financial system, and at the same time to reserve the right to prohibit the importation into England of bounty-fed sugar. Logically, he argued there was no difference between the class who infringed the Merchandize Marks Act and the class who imported into this country goods that had already a spurious profit upon them. In both instances there was a great damage inflicted on the trade of the country. (Applause.) In both instances—the case of a man importing fraudulent goods, and

* For the opinion of the trade on this subject, see the numerous and influentially signed petition to Lord Salisbury, given in the *Sugar Cane* for January, page 18

the case of a man importing sugar at a fictitious price—there was a fraud on the buyer. (Applause.) In the case of sugar imported with a bounty, there was already a profit on it which prevented the legitimate manufacturer from competing with it. He pointed out at the convention that he was most anxious to make an arrangement, if it met with the approval of other representatives, by which they would render the existence of sugar bounties absolutely innocuous, and he also pointed out that, failing to meet with the co-operation of other Powers in this direction, England would still have the right to legislate for itself. He met all round with the utmost fairness and consideration. He felt that this proposal was no infringement of Free Trade; it was really the maintenance of the true principles of Free Trade; and to allow bounty-fed sugars to come into this country would be giving an advantage to foreign competitors which they ought not to possess. Such a doctrine as to suppose that these industries should be allowed in England bounty paid by other nations would be almost bordering upon imbecility. The bounty system was in direct opposition to Free Trade, and while he did not want to trouble the company with the principles of political economy, he held that nobody but a captious critic would argue that bounty-fed industries should be permitted to be promoted in this matter. (Applause.) He held such a system to be an infraction of Free Trade altogether, and that it would injure the position of our country both at home and abroad as regarded its colonial possessions. He proceeded to argue that in the case of bounty-fed industries the profits would go into the pockets of the producers, and not the consumers, and that if the products were admitted here manufacturers would be making spurious profits at the expense of the English consumers. In America there was a great amount of resource in this trade, and there was a possibility there of bounties. If they in America went in the direction of putting bounties on sugar, they would also employ their own ships, and while destroying our industry would also inflict a serious injury on our shipping industry. It would be only a question of time for America to introduce an elaborate system of bounties, but if this treaty of the convention came into force, all that would be stopped. (Hear, hear.) The proposals of the convention were not ratified, but a bill was in preparation at the moment, which would be introduced in the next session, which he hoped would give force to the recommendations that were put forth. If the proposals of the convention never came to anything, they were still in the position of

saying that Parliament had prohibited bounty-fed sugar. Convention or no convention, no bounty-fed sugar would make its way into this country. (Applause). They heard a lot of clap-trap about the absurdity of depriving us of buying in the cheapest market. He quite admitted the principle, but at the same time they had a right to inquire about the origin of the cheapest article. (Hear, hear.) A cheap article might be unfairly come by, and if they were going to defend the principle they might as well defend the industry of buying goods and "asking no questions," which he understood to be a very flourishing industry. (Laughter and applause.) It was not always safe to buy in the cheapest market, for in that case a man who stole a thing got it cheaper than anybody else. (Laughter and applause.) Sometimes, therefore, the benefit which was supposed to be conferred on the working man entailed a greater loss than it gave, just in the way that slave labour was pitted against free labour, though no one would argue that this kind of enforced labour was a benefit to the working man. (Laughter and applause.) If they went on the principle of getting the cheapest article, they might argue in favour of the sweating system, by which a man was required to produce the greatest amount of work for the lowest price. This system was not only against the principle of Free Trade; it was against the principle of humanity. (Applause.) The speaker concluded by thanking the company for the cordial reception they had given him.

Mr. SANDBACH PARKER proposed "The Houses of Parliament," to which the Hon. W. H. Cross, M.P., responded.

The health of Mr. George Martineau, Secretary of the British Refiners' Committee, was also proposed by the CHAIRMAN and duly responded to, and other toasts followed.

THE LIVERPOOL WORKMEN'S ANTI-SUGAR BOUNTY ASSOCIATION.

On the 7th ult., BARON DE WORMS, M.P., addressed a meeting of the members and friends of the above Association, which was held at the Rotunda Lecture Hall, William Brown Street. Several well-known working men also took part in the proceedings. During the evening an illuminated address and casket was presented to Baron de Worms, in acknowledgment of the valuable services he had rendered to the Association.

UNITED STATES PROPOSED SUGAR TARIFF AND BOUNTY.

The United States Senate has passed a bill which reduces the duties on raw sugar below D.S. No. 16, 50 per cent., and provides for a bounty of one cent. per pound (4s. 8d. per cwt.) on all sugar produced in the United States. As we stated in a previous number, it is scarcely likely that any alteration that may be finally determined upon can come into operation before June, 1890. The Schedule as passed by the Senate is as follows :—

SCHEDULE E.—Sugar—All sugars not above 13 Dutch standard in colour—Tank bottoms, syrups of cane juices or of best juice, melada, concentrated melada, concrete and concentrated molasses testing by polariscope not above 75 degrees; 7-10 cent. per pound (now 1 40-100 cents); and for every additional degree shown by polariscope 2-100 cent. additional (now 4-100 cent.) All sugars above No. 13 and not above No. 16, 1½ cents (now 2 75-100 cents.) All sugar above No. 16 and not above 20, 1½ cents (now 3 cents.) All sugars above No. 20, 2 cents (now 3½ cents.) Molasses, testing above 56 deg., 4 cents per gallon (now 8 cents.) Sugar candy and all confectionery, including chocolate confectionery, made wholly or in part of sugar valued at 12 cents or less a pound, and on sugars after being refined, when tintured, coloured or in any way adulterated, 5 cents per pound (now 5 and 10 cents.) Glucose or grape sugar, ¾ cent. (20 per cent. *ad valorem*.)

BOUNTY OF ONE CENT. PER POUND UNTIL APRIL, 1900.

Until April, 1900, there shall be paid to the producer of sugar, testing not less than 80 deg. by the polariscope, from beets, sorghum, or sugar cane grown within the United States, a bounty of 1 cent. per pound under such rules and regulations as the Commissioner of Internal Revenue, with the approval of the Secretary of the Treasury, shall prescribe. The producer of said sugar, to be entitled to said bounty, shall have first filed with the Commissioner of Internal Revenue a notice of the place for production, with a general description of machinery and methods to be employed by him, and with an estimate of the amount of sugar produced in the next ensuing year, and an application for a license to so produce, to be accompanied by a bond in a penalty, and with sureties, to be approved by the Commissioner of Internal Revenue, conditionally that he will faithfully observe all rules and regulations that shall be prescribed for such manufacture

and production of sugar, and shall have been duly licensed. The Commissioner of Internal Revenue, upon receiving the application and bond hereinbefore provided for, shall issue to the applicant a license to produce sugar from sorghum, beets, or sugar cane grown in the United States at the place and with the machinery and by the methods described in the application, but said license shall not extend beyond one year from date thereof. No bounty shall be paid to any person engaged in refining sugars imported into the United States, or sugar produced in the United States upon which the bounty herein provided for has already been paid or applied for, nor to any person except upon sugar produced by such person from sorghum, beets, or sugar cane grown in the United States. The Commissioner of Internal Revenue, with the approval of the Secretary of the Treasury, shall from time to time make all needful rules and regulations for the manufacture of sugar from sorghum, beets, or sugar cane grown in the United States, and shall, under the direction of the Secretary of the Treasury, exercise supervision and inspection of the manufacture thereof. The bounty herein provided for, including the expenses incident to the payment thereof, shall be paid from the duties collected and paid into the Treasury on sugars imported into the United States, and a sufficient sum for said purpose is hereby appropriated and shall be paid annually from the duties so collected, such annual appropriation and payment to continue until the first day of April, A.D. 1900, and not longer. Any person who shall knowingly refine or aid in the refining of sugar imported into the United States or upon which the bounty herein provided for has already been paid or applied for, at the place described in the license issued by the Secretary of the Treasury, and any person not entitled to the bounty herein provided for who shall apply for or receive the same shall be guilty of a misdemeanour, and upon conviction thereof shall pay a fine not exceeding \$5,000, or be imprisoned for a period not exceeding five years, or both, in the discretion of the court.

In 1627 the English settled at Barbados, and in 1643 sugar was first made there. In 1676 it was in its most flourishing state, and employed four hundred sail of vessels, which were, on an average, of 150 tons each. Charles II. in 1661 created thirteen Baronets of Barbados, each of whom had in the island not less than a thousand pounds a year, and some ten thousand pounds a year.—Dr. Moseley on Sugar (1799), page 26.

EUROPEAN BEET SUGAR PRODUCTION,

SOME TWENTY-FIVE YEARS AGO.

A comparison of the following figures with the present Beet Sugar production at page 167, shows the enormous development of this Industry in Europe during the past quarter of a century :—

	1860-61.	1861-62.	1862-63.	1863-64.	1864-65.
Germany (Zollverein)	117,000 ..	116,000 ..	128,000 ..	142,000 ..	157,000
France	93,000 ..	136,000 ..	161,000 ..	99,000 ..	139,000
Austria	56,000 ..	50,000 ..	68,000 ..	57,000 ..	88,000
Russia	50,000 ..	45,000 ..	28,000 ..	32,000 ..	37,000
Belgium	13,000 ..	17,000 ..	20,000 ..	19,000 ..	21,000
Tons.....	329,000 ..	364,000 ..	405,000 ..	349,000 ..	442,000

SUGAR EXPORTED FROM THE BRITISH WEST INDIES

AND BRITISH GUIANA—1862-1866.

In the August, 1888, *Sugar Cane*, page 451, will be found the particulars of the Exports of Sugar from the British West Indies for the past seven years (1881-1887). A comparison of the two statements shows that the present Exports are not quite double what they were twenty-five years ago.

	1862.	1863.	1864.	1865.	1866.
Antigua.....	12,934 ..	10,128 ..	2,632 ..	7,035 ..	12,880
Barbados	35,062 ..	32,498 ..	26,985 ..	33,288 ..	37,527
Dominica	2,872 ..	2,529 ..	2,031 ..	2,709 ..	2,738
Grenada	2,901 ..	4,509 ..	4,269 ..	3,725 ..	4,229
Jamaica.....	27,650 ..	25,727 ..	23,576 ..	21,265 ..	28,510
Montserrat	256 ..	332 ..	398 ..	415 ..	969
Nevis.....	1,786 ..	1,971 ..	807 ..	1,485 ..	1,798
St. Christopher	9,345 ..	10,048 ..	4,845 ..	10,189 ..	11,149
St. Lucia	4,868 ..	4,785 ..	4,291 ..	4,973 ..	6,099
St. Vincent	7,265 ..	6,812 ..	6,167 ..	6,231 ..	8,534
Tobago	3,615 ..	2,376 ..	2,168 ..	2,487 ..	3,974
Tortolo	87 ..	....	....	....	....
Trinidad	34,372 ..	30,052 ..	33,636 ..	27,922 ..	40,747
Bahamas	33 ..	....	....	24 ..	....
Demerara	43,679 ..	44,454 ..	46,300 ..	51,768 ..	55,235
Berbice	6,521 ..	4,897 ..	4,967 ..	4,888 ..	6,450
Tons....	193,246 ..	181,118 ..	163,072 ..	178,494 ..	220,839
Consumption in } Great Britain.. }	485,856 ..	495,050 ..	499,604 ..	545,781 ..	559,166
Pounds per head....	37.24 ..	37.46 ..	37.53 ..	40.75 ..	41.68

ON THE DETECTION OF FAHLBERG'S SACCHARINE.

BY SAMUEL C. HOOKER, PH.D.

From the *Journal of the Franklin Institute*.

A test has been recently described by E. Börnstein for the detection of saccharine, based upon the supposed formation of a sulpho-phtaleïn. Saccharine is heated with a slight excess of resorcine and a few drops of concentrated sulphuric acid; on the addition of water a solution is obtained which fluoresces strongly when rendered alkaline.

I wish to point out that this test is rendered valueless by an observation I made about a year ago. Resorcine, when treated with sulphuric acid *alone*, gives apparently precisely the same reaction as that which Börnstein describes as characteristic of saccharine.

The reaction as unfortunately been already used in several instances which have come under my notice, and the presence of saccharine inferred in cases in which it was probably altogether absent.

It has long been known that resorcine, when heated with zinc chloride, also gives rise to products which fluoresce strongly.

SUGAR TAXATION IN RUSSIA.

We read as follows in the *Journal de St. Pétersbourg* for November 20th:—

“The sugar industry has brought in to the Russian Government in 1887 a revenue of 20,533,691 roubles, of which 18,781,490 roubles are excise, 124,185 patenting dues, 198,101 fines, and 1,429,915 bounties on sugar exported, repaid to the Government. In comparison with the anticipations of the budget, there is a decrease of 554,309 roubles, exclusively on excise. It should, however, be stated that since 1881 the revenue from sugar has not ceased to increase at a considerable rate (3·7 millions in 1881, 8·0 m. in 1882, 8·8 m. in 1883, 12·4 m. in 1884, 13·8 m. in 1885, 18·5 m. in 1886, and 20·5 m. in 1887). This progressive movement results in part from the normal development of production, but still more from the gradual raising of the rate of excise. This duty was increased from 50 to 65 copecks per pound on the 1st of August, 1883, and to 85 copecks on the 1st of August, 1886.”—*Board of Trade Journal*.

REPORT UPON THE EXPERIMENTS AT DODDS
(BARBADOS), FOR 1887-88.

BY MESSRS. J. B. HARRISON AND J. R. BOVELL.

(Continued from page 85.)

From the table giving the monthly rainfall, it will be seen that the weather during the experiments was very suitable for nitrogenous manures, the continued rains enabling them to fully exert their effects, and that, from heavy falls of rain not having occurred in either June or August after the application of the manures, the danger of loss by drainage of the nitrates used was greatly reduced.

On the unmanured plot the yield was very low, the canes were dry, and contained a high proportion of fibre, whilst during their growth, the shortness of the internodes was very noticeable; they were small and short, the average weight being only two and a half pounds each. The unmanured canes in group ii. exhibited the same characteristics. The residue of the pen manure applied in 1884 gave an increase of about $9\frac{1}{2}$ tons per acre of produce, thus clearly showing the lasting properties of the manure, and when assisted by the nitrogenous dressing of sulphate of ammonia, one of about $14\frac{1}{2}$ tons. It was noticed with this latter plot, that its period of active growth apparently ended at a somewhat earlier date than in the case of any other plot receiving nitrogenous manures. The canes grown upon it were the richest in total sugars ($15\cdot65\%$) of all grown during this year's experiments. The application of the manure just before planting the canes gave an increase of over 19 tons per acre of produce, but the canes produced were of a ranker growth, decidedly less rich in sugars, and yielding a much poorer juice than any of the preceding plots.

In accordance with the results of previous years, the addition of nitrogen to the manuring of phosphates and potash has in all cases given greatly increased yields, the increase varying with the amount of nitrogen used; the individual canes also showing a steady increase in development. Also in accordance with previous results, the addition of the nitrogenous manures when applied at the rate of 40lbs. of nitrogen per acre has resulted in an increase of the percentage of the sugars in the canes and in the cane juice, as compared with the amounts contained in those manured only with the purely mineral manures; whilst, where higher amounts were used, this increase is

lessened accordingly as the nitrogen is increased. As in previous years, the results of the application of equal quantities of nitrogen in the forms of sulphate of ammonia and of nitrate of soda have been more satisfactory with the former than with the latter; both, however, giving better results than the use of nitrogen in dried blood, either by itself, or when top-dressed with sulphate of ammonia. In the comparative experiments with nitrate of soda and sulphate of ammonia, where the manures were applied at the rate of 260lbs. per acre of the former and 200lbs. of the latter, the nitrate of soda gave a slightly higher return of produce (canes and cane tops) than the sulphate of ammonia, but as the canes were not so rich in sugar and yielded a poorer juice, the results as judged by the yields of available sugar per acre were distinctly in favour of the ammoniacal manure. Where 390lbs. of the nitrate of soda were used against 300lbs. of the sulphate of ammonia, the latter gave better results both as regards total produce and available sugar, and where 520lbs. and 400lbs. were used respectively, the difference in favour of the ammonia salts became very marked, these yielding in round numbers 800lbs. more available sugar per acre than the nitrate of soda did. In the crops of 1886, 1887, and 1888 the following are the average of the results in available sugar obtained by the use of equivalent quantities of sulphate of ammonia and nitrate of soda.

TABLE No. 9.

COMPARISON OF THE YIELDS WITH SULPHATE OF
AMMONIA AND NITRATE OF SODA.

Number of plots used in experiments with each manure.	Manure applied.	Average yield in lbs. of avail- able sugar in juice per acre.	Excess of yield in lbs. of avail- able sugar by the use of Sulphate of Ammonia.
1886.—Nine	Sulphate of Ammonia ..	2,802	616
Five	Nitrate of Soda	2,186	
1887.—Eleven ..	Sulphate of Ammonia ..	8,729	1,249
Eleven ..	Nitrate of Soda	7,480	
1888.—Three	Sulphate of Ammonia ..	7,147	516
Three	Nitrate of Soda	6,631	

From consideration of the above results we can only conclude that upon the poor, somewhat shallow, well drained soil at Dodds, sulphate of ammonia is decidedly superior to nitrate of soda as the source of nitrogen for the sugar cane; and that this superiority is most probably due to the power possessed by sulphate of ammonia of resisting loss by drainage or washing through rains occurring directly after its application; and that this is the correct explanation is shown by the much greater difference occurring in the crop of the year 1887, when the application of the nitrogenous manures was followed by very heavy rainfalls, than in either of the other years, and by the fact that the increase obtained by the use of increased quantities of nitrate of soda is relatively less than that yielded by the increased quantities of sulphate of ammonia. It has been noticeable every year of the experiments that for some time after the manuring with the nitrogenous manures, the plots receiving nitrate of soda have surpassed the others in the vigour of their growth, but have fallen behind later on. We must point out that these results are only applicable to the soil and climatic conditions existing at Dodds, and that, possibly in other parts of the island where the soils are deeper and frequently richer, and where the canes are planted closer together (thus reducing the liability to loss by drainage), nitrate of soda may give better results than sulphate of ammonia; although, up to the present, all strictly comparative experiments made with these substances in the British West Indies and in Demerara have given similar results to ours.

As we mentioned before, the experiments with dried blood alone, and with dried blood and top dressings of sulphate of ammonia, did not give as favourable results as those with either of the more active nitrogenous manures. In future years, organic nitrogenous manures will be applied soon after the cane has commenced its growth, when we may reasonably expect more satisfactory results.

The highest apparent profit on this series of experiments was obtained by sulphate of ammonia used as a top dressing to the plot heavily manured in 1884 with pen manure; the next highest by the use of four hundred lbs. per acre (80lbs. nitrogen) of sulphate of ammonia with cinereals; this latter result is not what would be usually obtained, and was, in great measure due to the prolonged and very favourable distribution of the rainfall. The apparent profit was greatest in all cases where sulphate of ammonia was used than were nitrate of soda was, the cost of the dressings of each of them at the

prices charged in 1887 being identical. At the present local prices (\$85 per ton for sulphate of ammonia and \$55 per ton for nitrate of soda), the sulphate of ammonia would still have given the better results, although to a considerably less extent. The nitrogen in the dried blood costing more per unit than that in either of the other forms, and when applied in quantity during the time of active growth, not being so efficient, the apparent profit was less upon the plots receiving it than upon the others.

SERIES 2.

Experiments with the Mineral Constituents of Manures.

This group of plots was sub-divided into two parts; the first, for experiments upon the addition of different forms and proportions of phosphatic manures; the second, upon the addition of different proportions of potash; whilst to control the results there were duplicate plots left unmanured. There were eight plots used for experiments with phosphates and four for those with potash. In the former, each plot received nitrogen in the form of sulphate of ammonia, to an amount of 40lbs. per acre applied in two dressings, and sulphate of potash at the rate of 50lbs. per acre, equivalent to about 25lbs. of potash. Three of the plots received in addition superphosphate of lime at the rate of 200, 300, and 400lbs. per acre, equal to, in round numbers, 70, 105, and 140lbs. of "assimilable phosphates" respectively; four others received insoluble phosphates either in the form of precipitated phosphates or of very finely ground mineral (Aruba) phosphates in equal money values to the lowest and highest dressings of superphosphate; whilst one plot received nothing in addition to the nitrogen and potash. The plots used for the experiments with potash received a similar amount of sulphate of ammonia, and superphosphate at the rate of 240lbs. per acre, supplying 84lbs. of assimilable phosphates; one of these plots received nothing further, one 40lbs., one 80lbs., and one 120lbs. of sulphate of potash per acre equal to, approximately, 20, 40, and 60lbs. of potash. Tables 10 and 11 give the field and mill results of these experiments, whilst in Tables 12, 13, and 14 are the composition of the canes, cane juice, and megass obtained. There was a difference in the yields of the unmanured plots amounting to 2.18 per cent. of their mean yield; the gains in produce and the apparent profit from the manurings have been calculated upon the mean of the two plots.

TABLE No. 10.
RESULTS OF THE REAPING OF THE CANES.—MINERAL SERIES.

MANURING OF PLOTS.	Cost per Acre.	Number of Canes.		Weight per Acre of				Average Weight in lbs. of one		Gain in cwt. of Produce per Acre upon	
		Per Acre.	Per Clump.	Produce.	Cane Tops.	Canes.	Tons. Owt. Tons. Owt.	Cane Top.	Clump of Canes.	No Manure.	No Phos- plates.
No Manure A.	\$ 0.	13,556	11.2	Tons. Owt. 23 7 $\frac{1}{2}$	5 0 $\frac{1}{2}$	18 7		.83	34.03	....	....
No Manure B. . . . .	....	14,116	11.7	22 7 $\frac{1}{2}$	4 10 $\frac{1}{2}$	17 17		.72	2.82	....	....
Nitrogen and potash.	8 50	14,883	12.3	30 7 $\frac{1}{2}$	5 13 $\frac{1}{2}$	24 13 $\frac{1}{2}$		.85	3.71	139.7	....
Nitrogen, potash, and superphosphate, 70lbs. assimilable phosphates.	11 0	15,709	12.9	38 19	6 7 $\frac{1}{2}$	32 11 $\frac{1}{2}$		.91	4.04	311	182.2
Nitrogen, potash, and superphosphate, 105lbs. assimilable phosphates.	12 25	16,415	13.5	35 8 $\frac{1}{2}$	5 19 $\frac{1}{2}$	29 8 $\frac{1}{2}$		.83	4.01	240.5	100.7
Nitrogen, potash, and superphosphate, 140lbs. assimilable phosphates.	13 50	13,713	11.3	31 18 $\frac{1}{2}$	5 2 $\frac{1}{2}$	26 16 $\frac{1}{2}$		.84	4.37	170.5	30.7
Nitrogen, potash, and precipitated phosphates, 77lbs. phosphates.	11 0	13,754	11.4	34 19 $\frac{1}{2}$	6 12	28 7 $\frac{1}{2}$		1.07	4.02	231	101.2
Nitrogen, potash, and precipitated phosphates, 154lbs. phosphates.	13 50	17,020	14.0	34 4 $\frac{1}{2}$	5 19 $\frac{1}{2}$	28 4 $\frac{1}{2}$		.79	3.72	216.7	87
Nitrogen, potash, and mineral phosphates, 132lbs. phosphates.	11 0	14,822	12.2	31 19 $\frac{1}{2}$	6 1	25 18 $\frac{1}{2}$		.91	3.92	171.5	31.7
Nitrogen, potash, and mineral phosphates, 264lbs. phosphates.	13 50	14,923	12.3	31 2	5 5 $\frac{1}{2}$	25 16 $\frac{1}{2}$		.83	3.88	154.2	14.5
Nitrogen and phosphates.	9 70	12,935	10.7	27 2 $\frac{1}{2}$	4 17 $\frac{1}{2}$	22 5 $\frac{1}{2}$		.83	3.85	96.7	No Potash
Nitrogen, phosphates, and sulphate of potash, 20lbs. potash.	11 13	15,920	13.1	35 0 $\frac{1}{2}$	5 14	29 6 $\frac{1}{2}$		.80	4.12	255	158.2
Nitrogen, phosphates, and sulphate of potash, 40lbs. potash.	12 56	15,932	13.2	35 6 $\frac{1}{2}$	5 14 $\frac{1}{2}$	30 12		.80	4.34	280 $\frac{1}{2}$	184
Nitrogen, phosphates, and sulphate of potash, 60lbs. potash.	14 0	14,890	12.3	35 3 $\frac{1}{2}$	5 15	29 8 $\frac{1}{2}$		.86	4.43	258	161.2

TABLE No. 12.
COMPOSITION OF THE CANES MINERAL SERIES.

MANURING OF PLOTS.	Water.	Sucrose.	Glucose.	Ash.	Albu- minoids.	Organic matters.	Fibre.	Nitrogen in Albuminoids.
No manure, plots A and B.	65.87	13.02	.34	.58	.28	2.75	17.16	(.045)
Nitrogen and potash.	67.35	14.27	.35	.51	.21	1.97	15.34	(.034)
Nitrogen, potash and superphosphate—70 lbs. assimilable phosphates.	78.57	13.73	.37	.49	.17	3.09	13.58	(.023)
Nitrogen, potash, and superphosphate—105 lbs. assimilable phosphates.	68.17	13.14	.44	.50	.24	3.39	14.12	(.039)
Nitrogen, potash, and superphosphate—14 lbs. assimilable phosphates.	68.69	13.98	.52	.49	.23	2.90	13.19	(.038)
Nitrogen, potash, and precipitated phosphates— 77 lbs. phosphates.	66.84	13.56	.39	.59	.27	2.86	15.49	(.043)
Nitrogen, potash, and precipitated phosphates— 164 lbs. phosphates.	68.46	13.41	.33	.47	.23	2.59	14.51	(.038)
Nitrogen, potash, and mineral phosphates— 132 lbs. phosphates.	65.31	14.06	.32	.52	.34	4.39	15.16	(.039)
Nitrogen, potash, and mineral phosphates— 264 lbs. phosphates.	67.91	12.99	.30	.38	.26	2.57	15.59	(.041)
Nitrogen and phosphates.	69.60	13.27	.27	.38	.19	2.20	14.09	(.030)
Nitrogen, phosphates, and sulphate of potash— 20 lbs. potash.	66.29	13.37	.38	.47	.23	2.83	16.43	(.037)
Nitrogen, phosphates, and sulphate of potash— 40 lbs. potash.	67.46	13.66	.50	.46	.21	1.73	15.98	(.033)
Nitrogen, phosphates, and sulphate of potash— 60 lbs. potash.	68.96	13.14	.29	.46	.25	2.16	14.74	(.040)

TABLE No. II.
RESULTS OF THE CRUSHING OF THE CANES.—MINERAL SERIES.

MANURING OF PLOTS.	167° F. Imperial Gals. of Juice per acre.	60° F. Density. Beaumé.	Percentage of Juice by Mill.	84° F. Lbs. per Im- perial Gallon of Sucrose.		Percentage in Cane.	Lbs. per Acre of Sucrose In Cane. Juice.		Lbs. in Sugar in Juice.	Profit per Acre by Manur- ing upon No Phos- phates. No Manure.	
				Sucrose.	Glu- cose.		In Cane.	In Juice.		\$ c.	\$ c.
No Manure A.	2,105	11.4	54.3	1.895	.051	13.02	5,351	3,892	3,730	....	....
No Manure B.	2,047	11.4	54.3	1.895	.051	13.02	5,200	3,781	3,620	....	....
Nitrogen and potash	3,070	11.3	58.5	1.999	.050	14.27	7,897	6,014	5,782	19 84	....
Nitrogen, potash, and superphosphates—70lbs. assi- milable phosphates	4,154	11.4	60.3	1.960	.055	13.73	10,022	7,981	7,573	37 72	17 88
Nitrogen, potash, and superphosphates—105lbs. assi- milable phosphates	3,758	10.9	60.2	1.908	.066	13.14	8,661	7,024	6,652	24 96	5 12
Nitrogen, potash, and superphosphates—140lbs. assi- milable phosphates	3,500	11.2	61.7	1.921	.074	13.98	8,388	6,583	6,198	18 4	Loss
Nitrogen, potash, and precipitated phosphates—77lbs phosphates	3,458	11.1	57.5	1.963	.057	13.56	8,614	6,658	6,398	23 4	3 20
Nitrogen, potash, and precipitated phosphates—164lbs. phosphates	3,539	11.2	59.2	1.957	.050	13.41	8,482	6,782	6,520	22 6	2 22
Nitrogen, potash, and mineral phosphates—132lbs. phosphates	3,281	11.3	59.8	1.976	.047	14.06	8,155	6,352	6,119	19 55	Loss
Nitrogen, potash, and mineral phosphates—164lbs. phosphates	3,227	11.	59.	1.928	.047	12.99	7,511	5,981	5,856	13 76	6 8
Nitrogen and phosphate	2,771	11.4	58.9	1.996	.044	13.27	6,677	5,399	5,220	9 60	No Potash
Nitrogen, phosphates, and sulphate of potash—20lbs. potash	3,807	10.9	59.7	1.911	.055	13.37	8,785	7,127	6,852	28 58	18 90
Nitrogen, phosphates, and sulphate of potash—40lbs. potash	3,796	11.3	58.6	1.989	.060	13.66	9,362	7,395	7,053	29 66	20 6
Nitrogen, phosphates, and sulphate of potash—60lbs. potash	3,758	11.	60.1	1.928	.050	13.14	8,664	7,100	6,817	25 27	15 60

TABLE No. 12.
COMPOSITION OF THE CANES MINERAL SERIES.

MANURING OF PLOTS.	Water.	Sucrose.	Glucose.	Ash.	Albimnoids.	Organic matters.	Fibre.	Nitrogen in Albuminoids.
No manure, plots A and B.	65·87	13·02	·34	·58	·28	2·75	17·16	(·045)
Nitrogen and potash.	67·35	14·27	·35	·51	·21	1·97	15·34	(·034)
Nitrogen, potash and superphosphate—70 lbs. } assimilable phosphates.	78·57	13·73	·37	·49	·17	3·09	13·58	(·028)
Nitrogen, potash, and superphosphate—105lbs. } assimilable phosphates.	68·17	13·14	·44	·50	·24	3·39	14·12	(·039)
Nitrogen, potash, and superphosphate—14lbs. } assimilable phosphates.	68·69	13·98	·52	·49	·23	2·90	13·19	(·038)
Nitrogen, potash, and precipitated phosphates— } 77lbs. phosphates.	66·84	13·56	·39	·59	·27	2·86	15·49	(·043)
Nitrogen, potash, and precipitated phosphates— } 154lbs. phosphates.	68·46	13·41	·33	·47	·23	2·69	14·51	(·038)
Nitrogen, potash, and mineral phosphates— } 132lbs. phosphates.	65·31	14·06	·32	·52	·34	4·39	15·16	(·039)
Nitrogen, potash, and mineral phosphates— } 264lbs. phosphates.	67·91	12·99	·30	·38	·26	2·57	15·59	(·041)
Nitrogen and phosphates.	69·60	13·27	·27	·38	·19	2·20	14·09	(·030)
Nitrogen, phosphates, and sulphate of potash— } 20lbs potash.	66·29	13·37	·38	·47	·23	2·83	16·43	(·037)
Nitrogen, phosphates, and sulphate of potash— } 40lbs potash.	67·46	13·66	·50	·46	·21	1·73	15·98	(·033)
Nitrogen, phosphates, and sulphate of potash— } 60lbs. potash.	68·96	13·14	·29	·46	·25	2·16	14·74	(·040)

TABLE No. 13.
COMPOSITION OF THE JUICE OF THE CANES, MINERAL SERIES.

MANURING OF PLOTS.	Water.	Sucrose.	Glucose.	Ash.	Albu- minoids.	Organic Matters.	Nitrogen in Albuminoids.
No manure, plots A and B.....	78.10	17.50	.47	.33	.07	3.53	(.011)
Nitrogen and potash.....	79.50	18.43	.46	.39	.06	1.16	(.010)
Nitrogen, potash, and superphosphate—70lbs. assimi- lable phosphates.....	79.44	18.08	.50	.33	.11	1.64	(.017)
Nitrogen, potash, and superphosphate—106lbs. as- similable phosphates.....	79.57	17.67	.61	.34	.09	1.72	(.015)
Nitrogen, potash, and superphosphate—140lbs. as- similable phosphates.....	78.70	17.76	.68	.32	.08	2.47	(.013)
Nitrogen, potash, and precipitated phosphates— 77lbs. phosphates.....	79.17	18.19	.54	.34	.08	.68	(.013)
Nitrogen, potash, and precipitated phosphates— 164lbs. phosphates.....	78.03	18.10	.46	.34	.10	2.97	(.015)
Nitrogen, potash, and mineral phosphates—132lbs. phosphates.....	78.31	18.26	.43	.34	.07	2.59	(.011)
Nitrogen, potash, and mineral phosphates—264lbs. phosphates.....	78.68	17.85	.43	.35	.09	2.60	(.014)
Nitrogen and phosphates.....	78.36	18.43	.39	.31	.06	2.45	(.010)
Nitrogen, phosphates, and sulphate of potash— 20lbs. potash.....	78.60	17.72	.51	.39	.07	2.71	(.011)
Nitrogen, phosphates, and sulphate of potash— 40lbs. potash.....	78.69	18.37	.55	.29	.09	2.01	(.014)
Nitrogen, phosphates, and sulphate of potash— 60lbs. potash.....	79.39	17.85	.45	.29	.08	1.94	(.013)

TABLE No. 14.
COMPOSITION OF THE MEGASS. MINERAL SERIES.

MANURING OF PLOTS.	Water.	Sucrose.	Glucose.	Ash.	Albu- minoids.	Organic Matters.	Fibre.	Nitrogen in Albuminoids.
No Manure, plots A and B.....	51.34	7.69	.19	.89	.54	1.80	37.55	(.087)
Nitrogen and potash.....	50.22	8.42	.19	.69	.44	3.07	36.97	(.070)
Nitrogen, potash, and superphosphate—70lbs. assimilable phosphates.....	52.06	7.12	.17	.74	.27	5.44	34.20	(.044)
Nitrogen, potash, and superphosphate—105lbs. assimilable phosphates.....	50.94	6.31	.19	.75	.47	5.86	35.48	(.075)
Nitrogen, potash, and superphosphate—140lbs. assimilable phosphates.....	52.56	7.93	.28	.77	.48	3.53	34.45	(.077)
Nitrogen, potash, and precipitated phosphates— 77lbs. phosphates.....	50.16	7.32	.19	.94	.53	4.42	36.44	(.085)
Nitrogen, potash, and precipitated phosphates— 154lbs. phosphates.....	54.58	6.45	.14	.67	.42	2.18	35.56	(.068)
Nitrogen, potash, and mineral phosphates— 133lbs. phosphates.....	45.95	7.82	.18	.80	.50	6.81	37.72	(.080)
Nitrogen, potash, and mineral phosphates— 264lbs. phosphates.....	52.41	6.01	.12	.68	.52	2.24	38.02	(.083)
Nitrogen and phosphates.....	57.05	5.92	.11	.50	.38	1.74	34.30	(.062)
Nitrogen, phosphates, and sulphate of potash— 20lbs. potash.....	48.07	6.94	.18	.59	.48	2.97	40.77	(.077)
Nitrogen, phosphates, and sulphate of potash— 40lbs. potash.....	51.57	7.00	.19	.70	.38	1.56	38.60	(.061)
Nitrogen, phosphates, and sulphate of potash— 60lbs. potash.....	53.27	6.06	.14	.72	.50	2.37	36.94	(.081)

From the tables it is apparent that a large increase of produce has been obtained by the manuring of sulphate of ammonia and potash, and that this increase has been more than doubled by the addition of 200 lbs. per acre of superphosphate, and where higher amounts of this were used, the increase obtained by the 200 lbs. has been continually lessened; these results being similar to those of former years. This injurious action of an excess of superphosphate has in each year of the experiments been noticeable soon after the application of the manures, a check in the growth of the canes then taking place, from which they recover, but slowly. The differences in the yields of these plots are far greater in proportion than those obtained upon the duplicate unmanured plots. Considerable increases in produce have also resulted from the additions of precipitated phosphates; on these plots the higher amount of phosphates has given a slightly lower yield, but as the difference between the two is less than in the case of the unmanured plots, it is probably due to the soil differences and not in any way to the manures. The same remarks apply to the experiments with the mineral phosphates. From the results it would appear that precipitated phosphates have produced a less beneficial effect than superphosphate in equal money values, when the latter has been applied in moderate proportions, and that heavy dressings of them whilst not producing any corresponding effect, have not exerted the injurious action that the superphosphate may do; and that mineral phosphates in the form of finely ground Aruba phosphate dust (of which over 70% passed through a sieve containing 4,000 meshes to the square inch) have not produced more than a very slight effect. These insoluble manures, having been applied at a late season, we were unable to obtain such an intimate mixture throughout the soil as is requisite for their action; in future years, therefore, they will be applied either directly before or after the planting of the canes.

The calculated pecuniary results in the experiments with phosphates may be summarised as follows: manuring with sulphate of ammonia and potash salts alone gave a considerable profit, which was very greatly increased by the addition of superphosphate in moderate amount, this increase becoming less with the addition of more superphosphate until the extra cost of the superphosphate, coupled with the decreased yield, more than counterbalanced the advantages obtained. Using precipitated phosphates resulted in a slight profit in both experiments, whilst the use of mineral phosphates resulted in loss.

In the experiments with potash, we find that the manuring with sulphate of ammonia and superphosphate alone gave a considerable increase of produce, less, however, than that obtained with sulphate of ammonia and sulphate of potash, and that this increase was a profitable one. The addition to the manures of sulphate of potash in the proportions supplying 20, 40, and 60 lbs. of potash per acre, gave much greater increases, and very largely increased profits, the manuring with 40 lbs. giving both the highest returns and the highest profits. The Dodds' soils, are particularly poor in available potash, and such largely increased yields by the use of large quantities of potash salts must not be expected upon the majority of the soils in the island. The results obtained last year leading to an expectation of increased saccharine richness in the canes manured with potash salts, in relatively high proportions, have not been altogether confirmed this year, as whilst in two of the experiments, the addition of potash apparently caused a slight increase in saccharine richness, the third, in which the potash had been applied in the highest proportion, has given an opposite result.

The effects of the manures upon the proportions of phosphoric anhydride and of potash contained in the canes.

As in the preceding year, the determinations of the proportions of phosphoric anhydride and of potash in the canes, which were carried out to ascertain the effects of the manures applied upon the amounts of these constituents, were made upon average samples of the juice and of the megass from the plots unmanured and manured with the substances under experiment. The results are given in table 15.

The average amounts of phosphoric anhydride and of potash in the canes reaped this year, were somewhat less than those reaped in 1887, being .052 and .074 per cent. respectively of phosphoric anhydride and of potash as compared with .058 and .099; their distribution was different, much more of the phosphoric anhydride, and less of the potash was present in the juice than in 1887, although as in that year the larger proportion of potash was found in the juice. The phosphoric anhydride appeared to be nearly equally divided between the juice and the megass. In the experiments with pen manure, the only point requiring notice is the high percentage of potash present in the canes, and especially in the cane juice grown upon the plot heavily manured in 1886. The manurings with superphosphate and potash salts did not increase the amounts of these substances present in the

TABLE No. 16.

THE PERCENTAGE OF PHOSPHORIC ANHYDRIDE AND POTASH IN THE CANES GROWN DURING
THE EXPERIMENTS.

DESCRIPTION OF MANURING.	Percentage in the juice of		Percentage in the megass of		Percentage in the Canes of	
	Phosphoric anhydride.	Potash.	Phosphoric anhydride.	Potash.	Phosphoric anhydride.	Potash.
No Manure	·056	·063	·068	·101	·061	·080
Pen Manure, 1884	·049	·053	·097	·106	·069	·075
Pen Manure, 1884, Sulphate of Ammonia	·046	·063	·067	·101	·054	·079
Pen Manure, 1886	·037	·115	·061	·090	·047	·104
Phosphates and Potash	·038	·051	·066	·071	·051	·060
Nitrogen, Phosphates and Potash	·040	·061	·063	·086	·049	·071
Nitrogen and Potash	·038	·049	·057	·081	·046	·062
Phosphates, Nitrogen and Potash	·040	·025	·059	·073	·047	·044
Nitrogen and Phosphates	·040	·081	·065	·106	·050	·091
Potash, Nitrogen and Phosphates	·037	·075	·056	·063	·044	·070

canes, in fact, they were present in smaller quantity than in the unmanured canes, but the addition of nitrogen to the manurings, whilst not appreciably affecting the phosphoric anhydride, caused a considerable increase in the amount of potash present. This was due to the fact that the canes which received nitrogen were, when cut, in a state of more active growth than those which received the purely mineral manures. The addition of superphosphate and of precipitated phosphates to the manuring of nitrogen and potash, did not affect the phosphoric anhydride, but the proportion of potash present was considerably reduced. In the canes grown on the plot which received only nitrogen and superphosphate, and which produced a comparatively low yield, the potash was present in high proportion, and the addition of potash to these manurings, giving rise to great increases in the yield, much reduced the proportions, both of phosphoric anhydride and potash present. It is worthy of notice that the canes receiving potash as a manure contained a lesser proportion of it in their expressed juice than those not receiving it.

The general manuring of the Estate.

To examine into the success of the methods adopted for the general manuring of Dodds, we determined the yields of four fields, differently treated as follows:—

No. 1. "House Field." This was manured by green dressings grown on the field and turned in; it received a dressing of Ohlendorff's Early Cane Manure, in January, 1887, at the rate of $2\frac{1}{2}$ per cwt. per acre. (10 lbs. nitrogen, 45 lbs. assimilable phosphates and 19 lbs. potash) and in June, $2\frac{1}{2}$ cwts. per acre of Ohlendorff's Dissolved Peruvian Guano (21 lbs. nitrogen, 56 lbs. assimilable phosphates and 7 lbs. potash).

No. 2. "Well Field" received pen manure, estimated to have cost \$24 per acre, before the canes were planted, and in June, $4\frac{1}{2}$ cwts. per acre of Ohlendorff's Dissolved Peruvian Guano. (38 lbs. nitrogen, 100 lbs. assimilable phosphates, and 12 lbs. potash.)

No. 3. "Nightengale Field" received pen manure at the same rate as No. 2, 1 cwt. per acre of the Early Cane Manure in January (5 lbs. nitrogen, 20 lbs. assimilable phosphates, and 8 lbs. potash), and in June, 3 cwts. per acre of Dissolved Peruvian Guano (25 lbs. nitrogen, 67 lbs. assimilable phosphates, and 8 lbs. potash).

No. 4. "Summervale Field" received pen manure at the same rates as the preceding ones, in June, 2 cwts. per acre of Early Cane

Manure (10 lbs. nitrogen, 40 lbs. assimilable phosphates, and 16 lbs. potash), and in August, 2 cwts. per acre of Ohlendorff's Dissolved Peruvian Guano (17 lbs. nitrogen, 45 lbs. assimilable phosphates, and 5 lbs. potash).

Fields Nos. 1, 2, and 3, are of about equal fertility; No. 4, part of which forms this year's experimental field for manures, is the least fertile field on the estate. The crops on Nos. 1 and 2 were reaped in March, and those on Nos. 3 and 4 in May.

The compositions of the produce and the results, are given in Tables 16 and 17. It is not necessary to make any further allusion to them, as both in yields of produce and available sugar, they fully speak for themselves.

TABLE No. 16.

COMPOSITION OF THE CANES, CANE JUICE, AND MEGASS.

No. of Field.	Composition of the.	Water.	Sucrose.	Glucose.	Ash.	Alb- minoids.	Organic Matters.	Fibre.	Nitrogen in Alb- minoids.
1	Cane	67.56	13.96	.53	.47	.76	1.83	14.89	(.121)
	Cane juice	79.46	17.03	.66	.24	.58	2.03	..	(.094)
	Megass	49.76	9.35	.25	.82	1.04	1.45	37.23	(.166)
3	Canes	66.71	12.55	.51	.52	.28	2.76	16.67	(.045)
	Cane juice	79.27	16.90	.71	.24	.12	2.76	..	(.020)
	Megass	49.79	6.71	.23	.91	.50	2.73	39.13	(.080)
4	Cane	67.28	13.64	.38	.55	.27	2.62	15.26	(.044)
	Cane juice	78.90	17.69	.52	.37	.68	2.44	..	(.013)
	Megass	51.40	8.11	.21	.75	.53	2.84	36.16	(.085)

The proportion of Sugars remaining in the Megass.

In 1886, with canes averaging 14.72% of fibre, and 12.44% of total sugars, 10.29% of the latter was obtained in the juice and 2.15% left in the megass, or a loss of 17.3% of the total sugars. In 1887, the canes averaged 13.96% of fibre and 15.59% of total sugars, when 12.15% of sugars was extracted in the juice and 3.44%, equal to 22.06% of the whole, remained in the megass. This year, the canes averaged 15.20%

TABLE No. 17.
RESULTS OF THE GENERAL MANURING OF THE ESTATE.

No. of Field	Cost per Acre of Manures.	No. of Cane Acres.	No. of Cane in a Clump.	Weight per Acre of						Weight in Lbs. of one			167° F. Imp. gallons of Juice per Acre.	60° F. Density Beaume.	Juice by Mill per cent.	84° F. Lbs. per Imp. gallon of		Sucrose in Cane, per cent.	Lbs. per acre of				
				Produce.		Cane Tops.		Canes.		Cane Top.	Cane.	Clump.				St. crose.	Glu- cose.		Sucrose in		Canes.	Juice.	Avall- able Sugar in Juice.
				Tons.	Cwt.	Tons.	Cwt.	Tons.	Cwt.										Canes.	Juice.			
1	12 68	13,632	11.2	43	5½	5	16½	37	8½	.93	6.15	69.2	4.688	10.7	60	1.834	.072	13.96	11,76	8,600	8,093		
2	38 62	12,826	10.6	42	12½	6	4	36	12	.96	6.38	67.6	4.689	10.7	61.5	1.681	.071	12.50	10,248	7,881	7,384		
3	36 00	12,103	10	44	10½	4	8	40	2½	.81	7.42	74.2	4.890	10.8	57.4	1.824	.077	12.55	11,280	8,704	8,155		
4	35 00	13,393	11	33	1½	5	2	28	9½	.85	4.76	52.7	3.484	11.3	57.8	1.915	.057	13.64	8,700	6,505	6,212		

of fibre and 14·17% of total sugars, and we obtained 10·97% of sugars in the juice, and lost 3·20%, equal to 22·58% of the whole, in the megass. The mills used in these experiments have yielded about 60% of the weight of the canes in juice. Some experiments made by one of us with canes containing an average of 11·65% of fibre and 13·75% of total sugars and with a mill expressing from 68 to 70% of their weight, of juice gave 11·76% of sugars in the expressed juice and 1·99% in the megass; the loss being, therefore, about 14·5% of the sugars in the canes.

The effects of the Rainfall, &c., upon the Yield and Composition of the Canes.

Some idea of the paramount importance of the climatic conditions as affecting the yield and the composition of the canes may be obtained from Table 18, which gives the rainfall during the growth of the canes, the average yield of canes per acre, and their composition as determined from the experiments made during the past four years.

TABLE No. 18.

YIELD AND COMPOSITION OF THE CANES, 1885-88.

Crop of	Inches of Rain.	Weight of Canes per Acre.		PERCENTAGE COMPOSITION OF THE CANES.						
		Tons.	Cwt.	Water.	Sucrose.	Glucose.	Ash.	Fibre.	Albuminoids.	Organic Matters.
1885	64·77	28	3	69·00	15·29	·43	·57	12·50	·74	1·50
1886	43·75	15	1½	69·09	11·19	1·24	·42	14·72	·74	2·60
1887	84·58	30	13½	66·17	15·27	·32	·43	13·96	·40	3·45
1888	79·75	29	12	68·13	13·82	·35	·48	15·20	·26	1·76

It is evident from this table that the yield, and especially the composition of the canes, depends much more upon the rainfall and other climatic conditions than upon the manures used. A further instance of this will be found in Part III.

(To be concluded next month.)

UNITED STATES' SUGAR INDUSTRY.

THE REPORT OF THE COMMISSIONER OF AGRICULTURE ON THE
EFFORTS TO INCREASE THE DOMESTIC PRODUCTION OF SUGAR.

The Washington Commissioner of Agriculture, in his annual report of the efforts to increase sugar production in the United States, says:—"It is believed that by the adoption of the processes introduced by the Department and the spread of a more scientific agriculture, the quantity of cane sugar produced in the United States can be vastly increased. Since the Department first instituted a regular chemical control of a sugar factory in Louisiana, the production of cane richer in sugar has been secured, the method of manufacture rendered more effective and economical, and the interest of the planters enlisted in securing a more scientific method of manufacture. The quantity of sugar afforded by the maple forests of the country is necessarily limited, and it cannot be considered as an important factor in the sugar problem from a commercial view. There are many parts of the country which are well adapted to the culture of sugar beet, and we may hope to see in the near future a very considerable development of the industry. Already on the Pacific Coast beet sugar has been made successfully (?) for several years, and an additional impetus has recently been given to the industry. Not only in California, but also in Oregon and Washington Territory, are found extensive localities, where a beet rich in sugar can be grown. On this side of the Rocky Mountains, Northern Indiana, Southern and Western Michigan, Northern Ohio, and New York, also present soil and climate favourable to the culture of the sugar beet. It is not a vain hope, therefore, which leads us to expect a considerable development of this valuable industry within the next few years. One of the most promising sources of sugar, however, for home consumption is found in the sorghum plant." During the season of 1887 the Department succeeded in manufacturing, on a commercial scale, as high as 230lbs. of sugar per ton of cane, a quantity which seems almost marvellous when compared with the average results obtained by milling in Louisiana. As a result of this experiment, two large plantations in the south—one in Louisiana and one in Texas—have introduced the diffusion system, to the exclusion of the mill. The increase in the output of sugar is so great as compared with the additional expense of evaporation, as to indicate a speedy displacement throughout the entire sugar region of the south of the old process by the new.

MARTINIQUE.

From the *Journal des Débats*.

The year which has just closed has been tolerably favourable to the agricultural, commercial, and industrial interests of the colony; it may even be considered as having produced satisfactory results, if we take into account the quarantine which has isolated Martinique from neighbouring islands, the interdiction laid upon our commerce to Guadeloupe, and the small-pox epidemic, which has interfered with agricultural operations.

The exports for 1888, as compared with those for 1887, show an increase of fr.2,595,772. The quantity of sugar exported in 1888 is about equal to the preceding year, being only about 295 casks less than in 1887, viz. :—

	1888. Tons.		1887. Tons.
Usine Sugar	33,278	...	34,593
Brown „	6,156	....	4,988
Together	39,434		39,581½

Being a difference of 147½ tons in favour of 1887, representing 295 casks.

The sugars manufactured during the last campaign were sent to France, with the exception of 682 tons to foreign countries, and about ¾ ton to French colonies.

Our exports of rum show a sensible diminution, viz. :—

1887.	1888.
Gallons.	Gallons.
4,141,249	3,277,144

Being a deficit of 864,105 gallons.

This falling off is to be attributed to the sanitary position of the colony, which has stood in the way of molasses being imported from Guadeloupe and foreign colonies, and also to the advance in the price of sugar inducing the inhabitants to manufacture raw sugar instead of converting their syrups into tafia. The 3,277,144 gallons exported were distributed as follows:—

	Gallons.
France	3,169,457
French Colonies	1,631
Other Countries	106,056

SIR L. PLAYFAIR ON BIMETALLISM.

On January 31st, Sir Lyon Playfair, M.P., presided at one of the "Political Economy" dinners which take place at the National Liberal Club.

After the dinner, Mr. Alfred Milnes, M.A., read a paper on "The Report of the Gold and Silver Commission." Mr. Milnes contended that bimetallists ought to be prepared to answer the following questions:—(1) What were the evils against which the bimetallic remedy was directed; (2) did the causes of these evils lie within the same region as the proposed remedy; (3) was the remedy possible; (4) was it safe against introducing other evils? The evils proposed to be remedied were said to be due to fluctuations and fall of the gold price of silver; and these were found reducible to difficulties of exchange, trade, investment, and special difficulties of the Indian Government. Taken collectively such difficulties amounted to "depression of trade," or what should rather be called "redistribution of products." Nor had these evils been currency-produced as a rule; for a change due to currency must be general, and though the price of necessities had fallen, the price of luxuries had not. Examples carefully examined showed that the difficulties of Anglo-Indian trade lay in production and distribution and not in currency. Bimetallism was theoretically but not practically possible; and its adoption would be temporarily injurious to the working classes and permanently beneficial to no one.

Sir LYON PLAYFAIR then addressed the company. He pointed out that bimetallism was not a new demand for the currency of the world. The general practice of the world was trimetallism—gold, silver, and copper—varying in proportion according to the needs of the various countries. Silver was the currency most widely adopted, as it was used by 1,000 millions of people, or three-fifths of the entire population of the globe. It was obvious that nations adopted currencies which best suited the money work which the metals had to perform. For a great commercial country like England the implement of exchange must consist of the metal which would most efficiently and quickly perform the money work. Though barter of commodities was the chief method of effecting exchanges, there was a good deal for bullion to do in settling their balances, and gold thus became the implement of quick money work. Silver being 16 times heavier

than gold for equal values, it required 16 times more time to count it, 16 times more strength to handle it, and 31 times more space to hold it. If 16 parts of silver were legally fused with one of gold, there was a practical misapplication of 15-16ths of effort. The proposal now was to fix a ratio of about 16 to 1 between silver and gold, when the market value was 22 to 1. Under such a system debts would be paid in the cheaper metal and gold would disappear. Bimetallists promised a par of exchange as a compensation for accompanying inconveniencies; and no doubt a par of exchange would add much strength to a bitametallic currency of nations, though even greater strength in the implement of exchange might not compensate for the loss of speed in money-work. Currency should be nimble as well as strong. He could not admit that a par of exchange would be a result of a legal ratio between gold and silver. Those metals had a market value depending on the cost of production and the conditions of supply and demand. The inherent value of money was not in statute law. Good money required no force of law to make it acceptable, though bad money had been forced into circulation by law. If the legal ratio between gold and silver had been established at 1 to 16, there would be a difference between the legal and the market ratios. Coinage only absorbed half the productions of the precious metals, the other half being used in the industrial arts. There would always be a competition between manufacturers and coiners for the supply of the metal in demand, and this would affect the values. Under such circumstances an *agio** must be put on either gold or silver coin to fit it to the market value. The experience of the Latin Union showed that a combination of countries could raise the price of silver beyond the market value for a time, but countries like England, with a true bullion standard, were not likely to enter such a combination. What had made so many earnest and thoughtful men turn to bimetallism for a remedy against the fall in prices? They believed that most commodities had fallen in price since 1873, owing to the appreciation of gold. There had been, however, far more potent causes at work to produce the fall in prices in staple commodities. If by the term "appreciation of gold" was meant that in 1889 a sovereign bought

*The difference in value between metallic and paper money, or between one kind of metallic money and another. Thus, if paper money be at a discount, or gold or silver coins worn so much as only to pass at a reduction, the difference between its nominal and real value is the *agio*.

more commodities than it would have bought in 1872, then the term was synonymous with "fall in prices" and incontestably true. But appreciation was often used in a different sense, when the bimetallist contended that the scarcity of gold was the main cause of the fall in the prices of commodities. Though gold had been able to buy many things cheaper since 1873 it had not been able, except in agriculture, to buy cheaper labour, for in machine-using countries wages had steadily risen even through periods of depression. Let the three staple commodities—cotton, iron, and wheat—be taken as an illustration of the potent causes which had lowered the prices irrespective of the appreciation of gold. The application of machinery in the cultivation, harvesting, and cleaning of cotton had been so great that, while in 1873 a given amount of human labour produced 3 8-10th million bales in America, a much less amount of labour in 1887 turned out 6½ millions of bales. The economies in its manufactured products were still greater. In 1873 spindles made 4,000 revolutions in a minute; they now made 10,000. In the last 15 years the population of the world had increased 16 per cent., while the production of cotton goods had increased by 86 per cent. Again, in iron, while England had increased her production by 143 per cent., competing countries had increased theirs by 239 per cent. Lastly, with reference to wheat, the stronghold of the bimetallists, the original fall in price had been in America. There the economy of labour both in production and transportation had been very great. As for the large importation of low-priced wheat from India, where machinery was not used, since 1873 the railways had been developed in India, and the belt of land under cultivation had increased. The cost of labour in India was very low. Since 1873 the export duty of 7 per cent. had been removed, and the Suez Canal had been opened for traffic, reducing the cost of transport. The scarcity of gold, like the scarcity of capital it would represent, must gradually have produced less movement, less production, and less consumption of commodities, for since 1873 production, movement, and consumption had been greater than ever, though prices had been low. If it were true that the chief causes of the fall of prices were improvements of machinery, and new inventions resulting in enlarged capacity and greater economy of production, together with increased facilities of transport, it was obvious that no legal ratio established between gold and silver could ever raise prices to their old standard in 1872. Soon

after 1873 the Suez Canal had been opened, and that had led to a complete revolution in commerce. A great fleet of sailing vessels were rendered useless, and the first steamships built for the Canal had soon to be superseded. The reduction in the cost of transit and the extension of the use of the telegraph in commercial matters, had destroyed the small local markets and put in their place the one great world market; and these things had led to a dislocation of affairs, and a revolution in commerce. He could not give an equally satisfactory reason for the fall in the price of silver over the same period. Gold in relation to silver increased most in production over a long term of years. No doubt the Commission was right in attaching much importance to the fact that the price of silver was reduced when Germany adopted a gold standard, and the Latin Union ceased to coin silver. Since 1873 other nations had adopted a gold standard, and there had been an excess of silver in the market. England had felt the change most keenly because she was the chief mart for the produce of silver-using countries. The depreciation of silver, however, was not world-wide, for the prices of commodities and the wages of labour had not risen in silver-producing countries as they would otherwise have done. There were counteracting causes which might retard the further decline of silver for a considerable time, and even produce a substantial rise in the gold price of silver. But whether its price rose or fell was only interesting as showing that silver must always have its own market value in relation to gold, which no legal ratio could prevent. He could not even contemplate the possibility of a great commercial country like England tampering with its gold standard. It was by natural selection and not by statute law that money did its work in settling international balances.

Mr. S. Montague, M.P., Sir T. Farrer, Mr. M. Wood, and Professor Rhys Davis also took part in the discussion, and the company then separated.

Sugar, when first introduced into every country, was used only medicinally. Pliny leaves no room for doubt on this point. Even in Arabia, in Avicenna's time, (A.D. 980-1038) though sugar was an article of commerce from the East, there is no record of it being used in dietetic or culinary purposes for several centuries afterwards.

Sugar was employed originally to render unpleasant and nauseating medicines grateful to the sick; and in pharmacy, in syrups, electuaries, confections, and conserves.—Dr. Moseley on Sugar, 1799, page 75.

MONTHLY LIST OF PATENTS.

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Manchester; and 323, High Holborn, London.

ENGLISH.

APPLICATIONS.

18722. W. T. CROOKE, Stratford, Essex. *Improvements in pockets or bags employed in the manufacture of sugar and like substances, together with an improved process for cleansing the same.* 22nd December, 1888.

18800. J. DEMPSTER, Glasgow, (communicated by Robert Allan, Demerara.) *Improvements in sugar cane mills.* 24th December, 1888.

18872. E. J. BALL, London. *Improvements in the manufacture of sugar.* 27th December, 1888.

18952. C. D. ABEL, London, (communicated by Emil Kiderlen, Emil Kiderlen, junior, and Johannes Willem van Leenhoff, Holland.) *Improved treatment of syrups for the removal of impurities therefrom.* 28th December, 1888.

19047. R. W. HEWETT, Handsworth, Staffordshire. *A new or improved method of refining sugar by electricity.* 31st December, 1888.

783. J. HORNUNG and C. RABE, London. *Improvements in machines for slicing or cutting sugar cane, beetroot, and the like.* 15th January, 1889.

1600. G. B. MEE, London (communicated by Eduardo Claudio da Silva, Brazil.) *Improvements in the extraction of sugar from syrups.* 29th January, 1889.

ABRIDGEMENTS.

2511. ALFRED CHAPMAN, of Messrs. Fawcett, Preston & Co., of 17, York Street, Liverpool, Engineers. *Improvements in apparatus for evaporating saccharine or other solutions or liquids.* February 20th, 1888. This is an apparatus for promoting the circulation of the liquid under treatment from one pan to another of a series. It also comprises means for taking off the water of condensation of the steam which has been used for heating the liquid, and passing it from pan to pan, so that it will part with its remaining heat to the liquid. Pipes depend from 20 to 25 feet from the lower portions of each pan, and then rise and enter the next pan near its top. No valves, traps, or pumps are employed.

1392. B. E. R. NEWLANDS, of 27, Mincing Lane, London, and J. B. ALLIOTT, of Blooms Grove Works, Nottingham. *Improvements in apparatus for filtering saccharine or other liquids or solutions and appliances for cleaning the said apparatus.* January 30th, 1888. This invention relates to filter presses. There is a series of filtering members, each composed of a frame covered with and enclosed by a filtering cloth or media, and each one provided with a separate inlet and outlet device for the liquid under treatment. Each cell or member is arranged that it may be removed for cleaning without interfering with the others. The apparatus for cleaning the various parts comprises circular revolving brushes, &c., in a separate vessel.

642. E. EASTON & S. HOLLAND, 11, Delahay Street, Westminster. *Improvements in apparatus for extracting juice from sugar canes.* January 14th, 1888. This apparatus consists of two gratings between which the cane is moved forward, being acted upon during its passage by two sets of revolving circular saws or cutters which split it longitudinally. The juice is much more easily extracted from it after this operation.

16397. FEDERICO BAUDER, of 95, Boulevard, Beaumarchais, Paris. *Improvements relating to the refining of sugar and to the treatment of syrup obtained therefrom.* November 12th, 1888. According to this invention the raw sugar is treated by steam and electricity the latter in the form of sparks to produce ozone. The sugar is taken in its crystallized condition as delivered by the planter, and thoroughly ventilated by forcing air through it, removing thereby dust and other impurities. It is next transferred into a centrifugal apparatus which is so constructed that high or low pressure steam can be injected into it. If the pressure does not exceed six atmospheres, the sugar is put into the machine in a dry state as the moisture produced by the steam is sufficient for the bleaching operation. If a greater pressure is used the sugar is first suitably moistened. The centrifugal is closed by a hermetically fitting cover, which carries poles and terminates by which the current (from a suitable source) is introduced into the interior of the machine. The poles are arranged so as to maintain a constant spark between them. The sugar is treated by steam for about 10 minutes, which, besides having other effects, materially improves the conductivity of the mass. The current of electricity is now passed through for about 40 minutes, and the machine revolved. The syrup is thus run off and the sugar left in is

refined. Methods are described for finishing the product and for treating the syrup, and the powdered remainder from a preliminary crushing.

16395. A. LEBLANC, of Havana, Cuba, Engineer. *A new and useful improvement in sugar cane mills.* November 12th, 1888. This inventor drives the different pairs of rollers in a mill by independent gearing. He also provides knife edges or equivalent slitters in the shutes between the different pairs of rolls, which slit the bagass passing along.

16703. C. STAFFEN, of 40, Hewgasse, Vienna. *Improvements in lixiviating batteries for raw sugar or sugar mass.* November 17th, 1888. Chiefly improvements on a former patent, *i.e.*, No. 7119, 1887. A central vessel is divided into a number of cells, which contain the lixiviating solution. The solution may be taken from one cell at a time, and distributed equally among the raw sugar or sugar mass which is contained in a number of suitable washing vessels, which are provided with sieve bottoms. The fluid may be returned to the cells above by a service pipe. One advantage of this system is that the same cells will always contain the same kind of liquid.

18025. D. M. WESTON, of Boston, Mass., U.S.A. *Improvements in centrifugal machines.* 11th December, 1888. These improvements are applicable to centrifugal machines, such as are described in the specification of letters patent 10,103, 1884. The object of the invention is to enable an annular valve or lid which covers the opening in the bottom of the cage to be suspended out of the way of the operator when not required to close the said opening. For this purpose a hook is provided near the top of the vertical shaft.

4209. A. CHAPMAN, of 17, York Street, Liverpool, engineer. *Improvements in sugar cane mills.* March 19th, 1888. One of the characteristics of this invention is placing the knife or scraper which removes the megass from the crushing rolls in such a position that it effects its purpose at the earliest possible moment, and thus the megass does not absorb so much of the expressed juice. Another feature is the employment of hydraulic power to effect a yielding pressure between the main rolls.

BELGIAN.

ABRIDGMENTS.

71462. CHAMPY & SON, Antwerp. *Saccharification of amylaceous substances.* December 31st, 1885. The inventors' claim:—1. The

employment of sulphurous acid in a gaseous or dissolved state, or both, preferably under pressure and under the application of heat for the saccharification of amylaceous substances. 2. The elimination by ebullition, by the impulse of steam or non-oxidising gases without addition of foreign substances of the sulphurous acid, which has been used for the saccharification of amylaceous substances. 3. The utilisation of the eliminated sulphurous acid for new saccharifications.

71502. J. PUVREZ, Brussels. *Improvements in the process of filtering the juice extracted from beetroot cane, &c.* January 5th, 1886. The inventor claims: 1. The right of covering the cast iron frame of filter presses and such like with a metallic coating by means of electrotyping, mechanical or chemical coating, plating, steeping, &c., with the object of preventing the oxidation of the surfaces in contact with the filtering cloth. 2. The use of laths of wood or other analogous substance placed between the castiron frames, and the filtering cloths to prevent the latter being damaged by rust. 3. A method of washing the filtering surfaces without necessitating the opening of the filter, after all the saccharine juice has been exhausted.

71528. A. LADUREAU, Anderlecht. *Improved apparatus, called nécessaire Ladureau, for rapid testing of beetroot.* January 7th, 1886. This improved apparatus includes: 1. An iron probe rasp ending in four perpendicular blades, furnished with conical teeth, the points of which are turned downwards. This apparatus is intended to probe the beet or other root, such as Jerusalem artichokes, potatoes, &c., and to reduce to pulp a considerable quantity of the said roots by a simple to and fro motion imparted by the hand. 2. A press of cast iron and bronze enclosing a vessel movable or fixed, pierced by a large number of holes of one millimetre diameter, this vessel receives the pulp formed by the rasp. After closing this apparatus, the lid of which bulges out against the body of the press, it is pressed by means of a bayonet motion, and the juice which runs out through a side opening is collected in a small metal receptacle, which serves as a lid to a tank which is also of metal. This tank is half a metre in depth, and is graduated between 1050 and 1090, thus serving as gauge for taking the density of the juice extracted by pressure. A thermometer and correction table for the temperature couples the apparatus.

71706. C. STIEVENARD, Brussels. *Improvements in a sugar grinding machine.* January 21st, 1886. The claims are as follows: 1. A

method of purifying and moistening the crystallized sugar produced in factories and refineries of beetroot and cane sugar, and which is intended to be made into lump sugar, or, in fact, to be used for any other purpose. 2. An apparatus which realises these results either combined in one operation and in one factory or separately and in different factories. 3. The manufacture of crystallized sugar in a state of purity called refined sugar.

71776. F. DEMMIN, Brussels. *Process and apparatus for manufacture of sugar in cakes, &c.* January 27th, 1886. This new and improved method of clarifying specially consists in properly impregnating the saccharine matter freed from raw syrup, treating it in a vacuum in a special clarifying box and only necessitating the use of a minimum quantity of cleare for whitening the sugar.

71864. LEBAUDY FRÈRES, Brussels. *Improvements in the extraction of sugar by the use of baryta and caustic strontia in a raw state.* February 5th, 1886. The inventors claim:—1. The method of carrying out the new process of extracting sugar, which chiefly consists in:—*a.* The use of baryta and strontia in a raw state. *b.* The agglomeration of the raw material. *c.* The concentration of the alkaline lye produced in the purification of the raw products, allowing baryta and strontia to be obtained in agglomerated masses. 2. The application of a new process, and of the new methods affecting the same, to products of baryta and strontia, used in the extraction of sugar.

71876. J. V. P. LAGRANGE, Schaerbeek. *Improvements in extracting sugar from cane and beetroot syrup, by precipitating the mass in a crystalline form, and by alcoholic refining.* February 5th, 1886. This invention has for its object the extraction of sugar from cane and beetroot syrups of a certain quotient of purity, by precipitating the mass in a crystalline form, and by refining the powdered sugar with alcohol.

71989. J. FISCHER, Brussels. *Improved apparatus and process for purifying the juice of sugar, &c.* February 15th, 1886. This invention has for its object a process and apparatus which may be applied to the purification of sugar juice, the filtration of liquids of all sorts, and to the sifting of lye of starch, and other analogous articles. The process consists essentially in simultaneously emptying out of the receptacle the refined portions and the impurities or solid deposits from the liquid, while at the same time separating them one from another, without interrupting the refining process. To attain this

result the liquid to be purified, filtered, or sifted, is led into a receptacle and is there separated by means of filters, or suitable sieves in such a manner that the clear, purified liquid, filtered or sifted, will constantly run to one side, while the impurities or solid deposits from the liquid are held back by these same sieves or filters, and settle at the bottom of the apparatus, thus affording the possibility of continuous use.

71991. R. ENGLERT & F. BECKER, Brussels. *Improvements in the purification of saccharine juice.* February 15th, 1886. 1. The decoloration and purification of the saccharine juices by the addition of hydromonothionic acid, and of hydromonothionic salts. 2. The method of working the saccharine juices by the use of hydromonothionic salts, which consists in adding the juice which has been limed and carbonated up to 0.04% of alkalinity, 1% of salt above-mentioned, carbonating this up to 0.02%, heating it to boiling point, separating off the residuum by means of filter presses concentrating the juice, and then adding to this thickened juice 2 to 4% of the salts, and 1 to 2% of milk of lime, carbonating up to 0.03% of alkalinity, heating to boiling point, and extracting the residuum by means of filter presses. 3. Obtaining hydromonothionic acid by dissolving zinc or iron in sulphurous hydrated acid, by the addition of milk of lime, filtration, addition of oxalic acid to the filtered product, and then a new filtration. 4. Obtaining hydromonothionic salts by dissolving zinc in sulphurous hydrated acid, by consequent addition of the required bases, and by filtration.

72134. A. AULARD and A. SCAPER, Brussels. *Improved process for making use of the refuse formed in the extraction of sugar, molasses, &c.* February 24th, 1886. The essential points of the invention are: 1. Decomposition of any tribasic saccharate in hot water, boiling water, or water under pressure, and separation of the mixture by filtration. 2. Extraction of the sugar still contained whether washed or not by means of the carbonated liquid or part of the said liquid, obtained in the first decomposition. 3. The employment of the refuse of this second decomposition for the precipitation of sugar in solution diluted or concentrated without regard to the temperature. 4. The employment of a minimum amount of carbonic acid.

72164. M. KIEFE, Brussels. *Improved process for the purification of molasses sugar obtained by precipitation.* February 26th, 1886. The invention consists: 1. In a new process for the purification of molas-

ses sugar obtained by precipitation. In the concentrated molasses mixed and cooled by the application of an alcoholic cleare, which extracts all the impurities from the sugar by maceration, and by its passage through the powder or lumps of precipitated sugar. 2. The apparatus used for the purification of this precipitated sugar in which the various receivers can act independently of each other, or alcoholic cleare can pass from one refining vessel to the other through the various receivers mounted in battery. 3. The combination of an apparatus for concentrating molasses and of mechanical mixer for the production of precipitated molasses sugar with receivers for the purified molasses sugar, which is precipitated by means of an alcoholic cleare.

72284. E. LOZE, Brussels. *Improved method of extracting the juice from beetroot.* March 8th, 1886. The invention consists of a combination of methods, as follows:—The beetroot is reduced to pulp, slices or otherwise, and placed in a receptacle. This mass of beetroot is placed in motion till all its parts are intimately mixed. It is then pressed or otherwise treated in order to extract a part of the juice, the quantity of which is determined by the consistency in which the remainder must be preserved that it may mix rapidly. This remainder is then thrown into a second vessel to undergo the same process as before. A part of the juice is again extracted under the conditions above-mentioned, and the remainder thrown into a third vessel, and so on, so that the combination of the operations takes place in the following order:—"Mixing." 2. "Extraction of juice." 3. "Mixing." Extraction of juice as often as required. The longer this combination is extended the more completely will the sugar be extracted. The last operation may be more forcibly applied so as to leave less moisture in the residuum, and to leave it more fit for use.

72417. CHAMPY AND SONS, Antwerp. *Improvements in treating beetroot with sulphurous acid.* March 18th, 1886. The inventors claim the use of sulphurous acid, pure or mixed with carbonic gas or nitrogen, for simultaneously extracting purifying, discolorizing and transforming crystallizable sugar from the juice of beetroot.

72668. SCHWENGERS SOHNE, Brussels. *Improved method of extracting sugar from molasses and saccharine syrups.* April 6th, 1888. This invention has for its object, a process for extracting sugar from molasses and saccharine syrup, and at the same time recovering as exalates the salts contained in the molasses, a process which consist,

in dissolving the molasses and saccharine syrups in methylic alcohol or in a mixture of methylic and ethylic alcohols, and in transforming the salts contained in the molasses into exalates by the addition of oxalic acid dissolved in alcohol, and finally in precipitating these exalates by the addition of an excess of ethylic alcohol.

72871. P. T. LITWINENKO, Brussels. *Improved apparatus for bleaching and drying refined sugar.* April 24th, 1888. The inventor claims:—1. The process of submitting the boiling mass of refined sugar as soon as it is placed in the moulds to a speedy clarification, and drying by means of a specially closed apparatus, only communicating with the outside for the purpose of discharging the liquid or gaseous sub-products, and into which is introduced at will the cleare, the compressed air and the heat required for the rapid transformation of the moist boiling mass into perfectly white dry sugar of a grain more or less coarse and close. 2. The use of a special mould with compartments, easily taken to pieces, for the purpose of extracting the sugar which is obtained in the mould in lengthened prismatic blocks ready to be passed on to the cutting machine, and involving only a very slight loss. 3. The method of treating the sub-products of the refining process to make them with little delay, suitable some for preparing the cleare, others to be transformed into refined sugar.

72880. WARD-RAUX, Brussels. *Improved automatic rasp press for determining the density of beetroot.* April 24th, 1888. The invention consists in a method of working by the same driving wheel, and in the same machine an apparatus for rasping beetroot and a press for pressing the pulp, and combined with an automatic coupling motion in both directions, as regards the falling and rising of the piston of the press, the cylinder of which is composed of a receptacle, which, being first placed underneath the rasp to receive the pulp is transported when full under the piston, a new receptacle being placed beneath the rasp to be filled with pulp while the first lot of pulp is being subjected to the action of the press.

GERMAN.

ABRIDGMENTS.

45376. T. DSCHENFZIG, of Magdeburg. *Apparatus for decomposing saccharate of barium by means of carbonic acid in combination with calcium bicarbonate.* 6th September, 1887. In order to decompose the very considerable residuum of saccharate of barium which remains in solution when treated or saturated with carbonic acid, lime

is added towards the end of the saturation, carbonic acid is then further added till the lime is dissolved and the calcium bicarbonate formed is decomposed by boiling into calcium carbonate and carbonic acid which transforms the saccharate of barium into carbonate of barium.

45511. J. BYDZOVSKY, of Sekeric, near Neu Bydzov, Bohemia. *Cutting machine for chicory roots and such like.* 24th April, 1888. This cutting machine consists of a double section apparatus. For the first action scythe-shaped knives pass through a fixed grating and through a swinging grating. The latter retains the objects to be cut till the point of the knife has reached the first grating, the coarser parts of the material are then passed along by an oscillating device to undergo a second cutting operation.

AMERICAN.

ABRIDGMENTS.

386958. OTTO BIELMANN, of Jersey City, New Jersey. *Vacuum evaporating apparatus.* July 31st, 1888. This apparatus consists of a rotary vacuum pan, having a tapering shell of polygonal cross section which is revolved by suitable, preferably spur, gearing upon fixed circular heads or ends. These ends, which are supported upon a fixed axle passing through the pan, have V shaped ridges round their peripheries which fit corresponding grooves in the ends of the pan, and thus make a tight bearing which is further protected by means of an overlapping cap inside. Through the stationary head at one end the two terminals of a steam coil for heating the contents of the pan are passed, also the vacuum pipe (whose nozzle is provided with a deflecting hood), and a minor steam pipe opening into the said hood for the purpose of clearing the sides of the pan from crystals. The other head is perforated with holes to allow the introduction of a supply pipe for filling the pan; a vacuum guage pipe, a thermometer, and a sampling syphon. Each head has a glazed peep hole to allow of examinations. A second feed pipe is provided in the side of the apparatus and a main withdrawing hole closed by a screw cap on the opposite side when revolved the peculiar shape of the pan gives a wavelike motion to the sugar solution within, and this causes the crystals to form very rapidly. After revolving for a certain time, (determined by samples) about 2 to 4% of low grade sugar crystals is added through the second feed pipe which induces a still greater deposition of crystals. The inventor states that he can work lower

grade solutions than hitherto, and that high grade solutions yield at least 8 to 12% more sugar with this form of apparatus than heretofore.

387388. ALEXANDER YOUNG, of Honolulu, Hawaii. *Process of and apparatus for cleaning saccharine liquids.* August 7th 1888. The essential feature of this invention is the reparation of impurities from saccharine liquors by boiling in vacuum, which I believe to be entirely new. Consists of a vertical pan circular in cross section, provided with steam coil for heating and also means for exhausting. A central recessed position or well in the bottom of the pan contains the juice under treatment, which when it boils throws up a scum on to the surface. From there the scum is swept by a revolving oblique stirrer into an annular channel which surrounds the well, and thence can be pumped out. The scum evacuating pipe enters the bottom of the channel and projects upwards for a small space, so that any juice that may settle is not lost by being withdrawn with the scum. A modified form of the apparatus is also shown. By the use of these machines there is very little inversion.

387810. TEILE H. MULLER, New York. *Centrifugal machine.* August 14th, 1888. This inventor utilizes the force of the impetus of the liquid driven from the cage of the centrifugal machine to drive another one mounted on the same spindle.

387865. RICHARD L. DE LISSE, of Brooklyn, New York, (Assignor to the Centrifugal Filter Co.) *Centrifugal filter.* August 14th, 1888. This filter consists of a long, vertical, cylindrical vessel, open at top, and having its sides lined with felt which vessel is supported on, and revolved by a hollow, central spindle, supported at top and bottom in suitable bearings. An outer casing surrounds the upper portion of the vessel. The hollow spindle alone, referred to, is provided openings at or near the bottom of the vessel and serves to feed the same. The action is as follows: liquid is fed into the machine while in motion, and any insoluble or gritty particles therein are thrown by centrifugal force against the felt lining and retained there. The liquid meanwhile percolates up the felt, and is thereby still more filtered and thrown, over the top which has a large sloping flange, into the outer vessel.

391335. C. L. PORTER, of Chicago, Ill. *Apparatus for restoring the spent properties of charcoal.* October 16th, 1888. Chiefly for charcoal used in the manufacture of glycerine. It consists of a

horizontal or sloping cylindrical chamber or retort supported above a furnace of ordinary construction. This furnace also serves to heat a steam coil, from whence superheated steam is led by suitable pipes and connections to the back of the retort, and, passing through a perforated plate or grating, mixes intimately with the charcoal. Suitable fed, withdrawal, and steam exhaust apertures are provided. The substance may be dried above the retort, while a previous batch is being treated inside.

391894. G. W. GULLEDGE, of Briartown, Indian Territory. *Skimmer*. October 30th, 1888. This invention is for an improved skimmer, specially adapted for skimming sorghum while undergoing the usual boiling process. It consists of a handle of convenient length, to one end of which is pivotted an arm carrying a pan. This arm may be held, by means of a spring arrangement, in any one of three positions, viz.: in line with handle, or at right angles at either side, thus affording opportunity for reaching every part of the vessel.

AMERICAN.

ABRIDGMENTS.

394432. J. H. BASSLER, of Myerstown, Pennsylvania, U.S.A. *Apparatus for condensing liquids*. December 11th, 1888. This is an apparatus for "expelling the aqueous element contained in cane juice, glucose," &c. The liquid to be treated is placed in a tank, whence it is passed into a pressure cylinder where it is mixed with steam. From there it travels up a pipe which is elbowed and pierces the side of a vertical cylindrical chamber. The liquid and steam are projected downwards in this chamber through a rose which terminates the above-mentioned pipe. At the same time a current of heated air from a burner or burners passes up the chamber and extracts some of the moisture from the falling spray. The concentrated liquid is collected in a conical hopper near the bottom of the chamber. This hopper is circular in plan, and of rather less diameter than the inside of the chamber, the annular space between them serving for a passage for the hot air. The steam with which the liquor is mixed is set free when the mixture has passed the rose, and helps to heat the apparatus.

394433. J. H. BASSLER, of Myerstown, Pennsylvania, U.S.A. *Apparatus for condensing liquids*. December 11th, 1888. Very much the same apparatus as 394432, the air is heated by steam and a vessel is added to cool the condensed liquid.

394434. J. H. BASSLAR, of Myerstown, Pennsylvania, U.S.A. *Apparatus for condensing liquids.* December 11th, 1888. Similar to 394432, hot air in place of steam.

394234. D. M. WESTON, of Boston Mass., U.S.A. *Centrifugal machine.* December 11th, 1888. This invention consists in combining with the basket and spindle of a centrifugal machine, a loose lid or valve, surrounding the said spindle, and arranging a hook above the said basket so that the lid may be suspended thereon when desired, and thus be out of the way of operators.

395145. HENRY A. HUGHES, of Rio Grande, New Jersey, U.S.A. *Diffusion apparatus for the extraction of sugar from sorghum.* December 25th, 1888. A number of cells, placed in the form of a ring, are filled with water heated by means of steam to 100° F. A corresponding number of cane-holding baskets are hung upon a revolvable and vertically adjustable framework in such a manner that any basket may be lowered into any of the cells. The apparatus thus forms a circular diffusion battery. Suitable withdrawal cocks are provided.

Patentees of Inventions connected with the production, manufacture, and refining of sugar will find *The Sugar Cane* the best medium for their advertisements.

The Sugar Cane has a wide circulation among planters in all sugar producing countries, as well as among refiners, merchants, commission agents, and brokers, interested in the trade, at home and abroad.

NEW YORK PRICES FOR SUGAR.

From Willett, Hamlen & Co.'s Report, February 14th, 1889.

FAIR REFINING.	96o/o CENTS.	GRAND- LATED.	STAND. A.	STOCK IN FOUR PORTS.
Feb. 14, 1889.—4 13-16c.	5 9-16c.	7c.	6½c.	Jan. 1, 1889— 32,254 tons.
Feb. 16, 1888.—4½c.	5 7-16c.	6½c.	6¾c.	Jan. 1, 1888— 47,798 tons.
Feb. 17, 1887.—4 9-16c.	5 3-16c.	5 11-16c.	5 5-16c.	Jan. 1, 1887—102,279 tons.
Feb. 18, 1886.—5½c.	5½c.	6½c.	6c.	Jan. 1, 1886— 57,328 tons.
Feb. 19, 1885.—4¾c.	5¾c.	6½c.	5¾c.	Jan. 1, 1885— 89,186 tons.
Feb. 14, 1884.—5½c.	6¾c.	7¾c.	7½c.	Jan. 1, 1884— 60,900 tons.
Feb. 15, 1883.—6 15-16c.	7¾c.	8¾c.	8½c.	Jan. 1, 1883— 50,297 tons.
Feb. 16, 1882.—7c.	7¾c.	9½c.	8¾c.	Jan. 1, 1882— 43,927 tons.
Feb. 17, 1881.—7½c.	8 1-16c.	9 1-16c.	8¾c.	Jan. 1, 1881— 66,999 tons.
Feb. 12, 1880.—7¼c.	8 1-16c.	9¾c.	9c.	Jan. 1, 1880— 63,558 tons.

YEARLY RECEIPTS AT THE FOUR PORTS, NEW YORK, BOSTON, PHILADELPHIA, AND BALTIMORE (IN TONS), FOR TWELVE YEARS, 1877-1888.

FROM	Entire Year. 1888.	Entire Year 1887.	Entire Year 1886.	Entire Year 1885.	Entire Year 1884.	Entire Year 1883.	Entire Year 1882.	Entire Year 1881.	Entire Year 1880.	Entire Year 1879.	Entire Year 1878.	Entire Year 1877.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Cuba	463720	497647	543288	505129	457085	425431	502410	421371	436891	499552	437417	384007
British W. I. Islands ..	108404	106841	63855	71229	61938	45758	23701	20290	20062	12759	13576	22494
Trinidad, P. S.	27215	44971	36031	38852	37866	30048	8338	3563	5127	2244	10219	24397
French W. I. Islands ..	1736	6407	7781	11301	30053	32780	28449	22997	23229	26827	31215	24397
Porto Rico	36699	49975	35665	57962	56430	46526	34933	23902	25816	29535	31917	27463
St Croix	3727	4424	2226	1849	1279	902	1537	840	1147	1141	1577	1087
Demerara	49106	52831	40634	18678	19625	59614	34519	18613	18551	5878	6347	28910
Central America ..	296	13	22	329	444	476	971	685	2493	114	307	
Belize	359	380	228	637	764	833	605	515	655	522	504	
Surinam	1672	1762	1108	962	1403	1637	1944	1674	1555	1681	1385	12873
Mexico	—	37	278	167	98	373	430	842	669	956	333	
Havti & San Domingo..	17983	19019	16545	24048	16933	11756	12017	6818	10249	6086	5868	35892
Brazil	126875	136897	91244	126712	142348	91343	81029	107901	72389	21580	35859	
Peru	—	698	588	1497	943	1137	860	—	824	1539	601	—
Europe	127029	70589	149407	107945	83248	45889	7204	5941	2353	9208	4338	7142
Philippine Islands ..	77891	84965	140033	89206	96398	109081	75634	80940	74079	48941	41435	71117
Java	21274	4602	5709	8074	3254	576	5422	15707	15537	13316	15602	17955
China	147	—	4373	—	3865	7593	3827	5501	11353	—	2481	12898
Singapore	300	—	....	—	221	595	364	—	109	—	54	1087
Sundries	18725*	19606†	21661‡	18351	13646	7759	9801	7365	9742	4488	1006	7120
Foreign	1082958	1101664	1159696	1082928	1032871	920090	831155	745371	732830	687367	642631	654442
Domestic	1931	8977	1391	6226	9380	4386	6236	7839	5854	21640	11645	9985
Total	1084189	1110641	1161087	1089154	1042251	921476	839451	753210	738684	709007	654276	664427

* Mauritius, 5,865 tons; Sandwich Islands, 12,860 tons.
† Mauritius, 1,524 tons; Tuticorin, 10,679 tons; Sandwich Islands, 9,463 tons.
‡ Mauritius, 1,524 tons; Tuticorin, 1,028 tons; Sandwich Islands, 8,402 tons.

From Willett, Hamlin & Co.'s Circular, New York.

IMPORTS AND EXPORTS (UNITED KINGDOM) OF RAW AND REFINED SUGARS.

JANUARY 1ST TO JANUARY 31ST, 1888-1889.

Board of Trade Returns.

IMPORTS.

RAW SUGARS.	QUANTITIES.		VALUE.	
	1888.	1889.	1888.	1889.
	Cwts.	Cwts.	£	£
Germany	376,939	669,846	295,720	463,805
Holland	33,564	10,767	23,874	7,179
Belgium	80,983	92,340	59,999	54,785
France	1,005	18,431	999	12,168
British West Indies & Guiana	134,809	170,352	132,327	150,030
British East Indies	54,187	39,600	29,997	21,195
China and Hong Kong ....	....	....	....	....
Mauritius	5,200	5,095	3,000	3,580
Spanish West India Islands	....	....	....	....
Brazil	209,114	53,200	147,590	33,610
Java	548,567	26,000	451,561	20,150
Philippine Islands	61,900	21,965	30,795	10,570
Peru	95,720	54,300	75,447	40,300
Other Countries	39,626	99,648	26,771	58,303
Total of Raw Sugars ..	1,641,614	1,261,544	1,277,990	875,735
Molasses	11,443	14,611	4,565	5,498
Total Sugar and Molasses	....	1,276,155	1,282,555	881,233
REFINED SUGARS.				
	Cwts.	Cwts.	£	£
Germany	293,158	487,374	260,569	433,996
Holland	118,283	100,901	111,228	91,750
Belgium	19,704	24,071	19,079	22,532
France	78,810	139,662	75,773	121,929
United States	3,530	4,493	3,094	3,650
Other Countries	8,834*	104,529*	7,150*	86,788*
Total of Refined	522,319	861,030	476,893	760,645
EXPORTS.—REFINED SUGARS.				
	Cwts.	Cwts.	£	£
Sweden and Norway	2,785	3,423	2,405	2,628
Denmark	4,261	4,250	3,231	3,096
Holland	6,302	6,964	4,855	5,197
Belgium	4,354	2,988	3,314	1,954
France	615	503	480	379
Portugal, Azores, & Madeira	3,124	6,567	2,379	4,477
Italy	2,652	7,556	2,094	5,631
Other Countries	8,217	10,548	6,843	8,687
Total of Refined	32,300	42,799	25,601	32,049

* Entirely from Russia.

SUGAR STATISTICS—GREAT BRITAIN.

TO FEBRUARY 23RD, 1889 AND 1888. IN THOUSANDS OF TONS, TO
THE NEAREST THOUSAND.

	STOCKS.		DELIVERIES.		IMPORTS.	
	1889.	1888.	1889.	1888.	1889.	1888.
London	37	60	37	36	44	41
Liverpool ..	86	109	45	40	36	65
Bristol	2	4	12	7	11	8
Clyde	29	45	32	32	38	33
Total ..	154	218	126	115	129	147
	Decrease.. 64		Increase.. 11		Decrease.. 18	

SUGAR STATISTICS—UNITED STATES.

(From Willett and Hamlin's Circular.)

FOR THE FOUR PRINCIPAL PORTS. IN THOUSANDS OF TONS, TO THE
NEAREST THOUSAND. FOR JANUARY, 1889 AND 1888.

	STOCKS.		DELIVERIES.		IMPORTS.	
	February 1st.		In January.		In January.	
	1889.	1888.	1889.	1888.	1889.	1888.
New York	34	53	52	49	57	60
Boston	3	4	4	7	3	5
Philadelphia....	—	—	18	12	18	12
Baltimore .....	..	..	..	..	..	..
	—	—	—	—	—	—
Total.....	37	57	74	68	78	77
	Decrease.. 20		Increase.. 6		Increase .. 1	
Total for the year			1084		1100	

STOCKS OF SUGAR IN THE CHIEF MARKETS OF EUROPE ON THE
31ST JANUARY, FOR THREE YEARS, IN THOUSANDS
OF TONS, TO THE NEAREST THOUSAND.

Great Britain.	France.	Holland.	German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1889.	TOTAL 1888.	TOTAL 1887.
160	230*	41*	313	178*	24	946	955	1145

*Estimate.

CONSUMPTION OF SUGAR IN EUROPE FOR THREE YEARS, ENDING
31ST JANUARY, IN THOUSANDS OF TONS, TO THE
NEAREST THOUSAND.

Great Britain.	France.	Holland.	German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1889.	TOTAL 1888.	TOTAL 1887.
1236	453	36*	449	219*	347	2740	2694	252

*Estimate.

ESTIMATED CROP OF BEET ROOT SUGAR ON THE CONTINENT OF EUROPE
FOR THE PRESENT CAMPAIGN, COMPARED WITH THE ACTUAL CROP,
OF THE THREE PREVIOUS CAMPAIGNS.

(From *Licht's Monthly Circular*.)

	- 1888-89.	1887-88.	1886-87.	1885-86.
	Tons.	Tons.	Tons.	Tons.
France.....	475,000 ..	392,824 ..	485,739 ..	298,407
German Empire ..	975,000 ..	959,166 ..	1,012,968 ..	838,131
Austro-Hungary..	550,000 ..	428,616 ..	523,059 ..	377,032
Russia and Poland.	510,000 ..	441,342 ..	487,460 ..	537,820
Belgium	140,000 ..	140,742 ..	135,755 ..	93,690
Holland	45,000 ..	39,280 ..	36,098 ..	28,818
Other Countries..	55,000 ..	49,980 ..	49,127 ..	46,075
Total....	2,750,000	2,451,950	2,730,206	2,219,973

Mr. Licht's present estimate, as compared with his previous one, indicates a reduction of 28,000 tons. He reduces his estimate for Austria by 25,000 tons; for other countries, 5,500 tons; and he increases his estimate for Belgium by 2,500 tons.

Mr. Görz's estimate for present crop (1888-89), is 2,575,000 tons or 175,000 tons less than Mr. Licht's.

STATE AND PROSPECTS OF THE ENGLISH SUGAR MARKET.

The sugar market during the past month, without being active, has been healthy—and with the exception of beet 88%, which has advanced 7½d. per cwt., there has been but little variation in values.

The shrinkage of stocks, both here and in the United States, as compared with the corresponding period of 1888, amounts to about 85,000 tons.

Mr. Licht has again slightly reduced his estimate of the European crop 1888-9; his reductions since October amount in all to 100,000 tons. His present estimate is 2,750,000 tons, against Mr. Görz's estimate of 2,575,000 tons.

It is very evident that, with the increase in the consumption, stocks will continue light for some time to come, and importers have good grounds for expecting some improvement in prices.

The imports of foreign refined for January were 43,050 tons, against 26,117 tons for January, 1888.

The deliveries up to February 23, 1889, were 126,224 tons, against 114,913 tons for the same period in 1888; and the imports 128,695 tons, against 146,603 tons in 1888.

The stocks in the United Kingdom (four principal ports) on the 23rd February were 154,193 tons, or 63,634 tons less than at the same period in 1888.

Present quotations for the standard qualities, as under, are:—

	FLOATING.	Last Month.
Porto Rico, fair to good Refining	13/- to 14/3	against 13/3 to 14/6.
Cuba Centrifugals, 97% polarization	16/-	„ 16/3
Cuba, fair to good Refining	13/3 to 13/9	„ 13/6 to 14/-.
Java, No. 14 to 15 D.S.	16/3 to 16/9	„ 16/3 to 16/9.
British West India, fair brown	13/6 to 14/-	„ 13/-
Bahia, low to middling brown	10/- to 11/-	„ 10/9 to 11/6.
„ Nos. 8 to 9	12/- to 12/6	„ 12/3 to 13/-.
Peruams, regular to superior Americans..	11/- to 13/-	„ 11/3 to 13/9.
	LANDED.	Last Month.
Madras Cane Jaggery	10/9 to 11/-	against 10/3 to 10/6.
Manila Cebu and Ilo Ilo	10/- to 11/-	„ 10/- to 11/-.
Paris Loaves, f.o.b.	17/6 to 18/-	against 17/9 to 18/-.
Titlers	19/6	„ 19/6
Tate's Cubes	21/-	„ 21/6
Beetroot, German, 88%, f.o.b.	14/3	„ 13/7½

THE SUGAR CANE.

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VOL. XXI.

 The writers alone are responsible for their statements.

N.B.—All communications to be addressed, and Cheques and P.O. Orders made payable to HENRY THORP, Ducie Chambers, 57, Market Street, Manchester.

For Scale of Charges for Advertisements, see page xi.

For Table of Contents, see page iii.

In the present number we give (page 187) the concluding portion of the valuable report of Messrs. J. B. Harrison and J. R. Bovell, upon the Experiments at Dodd's (Barbados).

Sir T. H. Farrer has recently published, in pamphlet form, under the auspices of the Cobden Club, his letters on the Sugar Convention, which have appeared in *The Times*; with some others, which, though addressed to that paper, were not published. Its appearance at the present time is obviously with a view to influence Members of Parliament not to support the ratification of the Convention when the subject comes before the House of Commons.

It is satisfactory and cheering to note that the Chancellor of the Exchequer, whose soundness on the question of Free Trade, is not a doubtful quantity, is prepared to give his weighty support to the Government Bill (see page 218). If Lord Salisbury makes this question a Government one we have no fears as to the result.

In another part (page 175) will be found a criticism of Sir T. H. Farrer's book by the London Workmen's Anti-Bounty Association; and at page 207, Mr. Neill's reply to Sir Lyon Playfair on the same subject.

A meeting has recently been held in Bristol, in support of the Convention, at which the statement was made, that in the event of it being ratified by Parliament, a new refinery would be started in that city; as there would then be some security for such an investment of capital, which at present does not exist. (See page 211.)

A meeting has also been held in Greenock, at which, after discussing the present aspect of affairs, it was concluded to forward a resolution to Lord Salisbury and Mr. W. H. Smith, M.P., urging upon the Government the necessity of proceeding without delay to the ratification of the Convention.

It is doubtful now if the Government can carry the Bill through the different stages before the Easter holidays. The International Commission for dealing with the question meets on May 1st, and it is important that the measure should become law before the Commission assembles.

The Queensland Sugar Commission for inquiring into the general condition of the sugar industry in that colony, which we mentioned in our last number had been appointed, has commenced work. In January several plantations were visited, and evidence taken from Mr. E. Eglinton, Polynesian Inspector; Mr. Thomas, of Thomas and Madden, merchants; Mr. Fregise; Mr. Smith, the manager of the Pyramid Plantation; also from Messrs. T. & W. Swallow, and Mr. Dennis Dillon.

At page 184 we insert a letter addressed to *The Times*, from Sir Ambrose Shea, Governor of the Bahamas since July, 1887, on "Fibre Cultivation" in those islands; a new industry which bids fair to convert the barren Bahamas into prosperous lands. This sisal plant (so called from Sisal a port in Yucatan) which is to effect so great a change, has hitherto been looked upon as a pest, which bade defiance to all attempts to extirpate it. It has now, however, been discovered to be of great value for cordage, and is said to be "equal to very good Manila for rope making." Ropes made from it have been valued at from £30 to £40 per ton in this market. This plant is said to thrive under all conditions, being unaffected either by droughts or floods.

In the *Sugar Cane* for August, 1887, we gave Mr. Quintin Hogg's report of his first experiment with "diffusion" on his Demerara Estate *Nonpareil*, which was considered to be unsatisfactory. The difficulties which were then experienced, and which, it was feared, might prove insurmountable, have been overcome.

At page 204 of the present number will be found the report of the latest experiments on the same estate. The cost of the plant, including erection, is put down at £11,500; but it is calculated that the cost in

future of a plant of equal capacity will not exceed £6,000. The percentage of sugar obtained is 10·620 per cent. of the cane, and the cost in coal per ton of 1st sugar, 22 cwt.,—or a total consumption of say 2,623 tons of coal.

We learn from Messrs. H. & A. Gibbs, of Chingford, that during the past month they have exported another of their sugar drying machines to Belgium to the order of the Société Construction, Tirlemont.

Messrs. Gibbs have reason to feel satisfied at having obtained this order, which was only entrusted to them after the above mentioned firm had made a careful inspection of a Gibbs' machine, which we reported recently as having been erected at the Raffinerie Tirlemontoise, Tirlemont.

The Norddeutsche Zuckerraffinerie Frelstedt declares a dividend of 18½ %, and that of Rositz, 8½ %.

We still continue to hear of the establishment of new Beetroot Sugar Factories. In addition to those already announced in *The Sugar Cane* of December, January, February, and March, we now learn that one is to be erected at Delitzsch (Saxony), with a capital of M.700,000; another at Gommern (Saxony), a third at Perleberg (Uckermark), and a fourth at Eilenburg. Towards the capital required for that at Goldberg M.724,800 has already been subscribed. A large refinery, with a capital of M.3,000,000, is also to be erected at Neufahrwasser (Prussia), and another at Hameln (Hanover), with a capital of M.2,000,000. Both will be worked on the Steffen system.

Turning to Austria-Hungary, we find that the Berlin banking-house of Bleichröder & Co. has contributed half of a total subscribed capital of fl.3,000,000 (£250,000), the remaining subscribers being Herren Carl Steffen, of Vienna, and Friedr. Czell and Söhne, of Kronstadt, the three together constituting the Ungarische Zucker-Industrie-Gesellschaft of Buda-Pesth, whose object is the establishing of new sugar factories and refineries. One at Zemplin, and another at Kronstadt, are to commence work this year. Three others are to be erected next year. The Company, which is actively supported by the Government, binds itself not to export any sugar for three years, and during that period to put none of its shares on the market. Other factories are being put up at Dombovar and at Bothfalva.

HOLLAND.—A company, under the name of Cultuur Maatschappij Gempolkrek, capital fl.600,000 (£50,000), has been formed to work a sugar plantation of that name in Soerabaya (Java).

RUSSIA.—In the province of Orenburg (Eastern Russia) the erection of a factory to turn out annually about 60,000 poods (not quite 1,000 tons) of sugar, is in contemplation.

The following statistics, showing the dividends for the past three seasons of Russian sugar factories and refineries, are remarkable as indicating the general improvement of the last campaign upon the two previous ones:—

	1885-86.	1886-87.	1887-88.
Strogonowka	6	10	25 per cent.
Tschupachowka	10	10	25 „
Kalnik	12	6	20 „
Kamenogorka Sob	?	0	20 „
Sobolewka	12	10	17½ „
Gorodok	6	10	17 „
Jaropowitschi	6	5	15½ „
Borowka	6	15	15 „
Silkowzy	6	15	15 „
Schtschedrow	6	10	14 „
Berschada	0	6	14 „
Kissilewka	?	?	14 „
Lewaschewo Woitzowzy ..	0	6	12 „
Tscherkassy Refinery .. .	?	9	11½ „
Kiew Refinery	5	17½	11 „
Grigorowka.. . . .	?	8	11 „

Four others have this year declared 10%, one 9%, one 6%, one 5%, and one 4%. Fifteen declare no dividend. On the whole it is certain that the prospects of the Russian sugar industry are decidedly improving, and this is further proved by the increased value of the shares.

Of late years American sugar manufacturers have, as is well known, been using vacuum pans of unusually large dimensions, constructed of cast-iron hoops, each composed of individual segments, and capable of boiling up charges of 1,500 cwt. in 4 to 4½ hours.

Encouraged by the success of former experiments, apparatus of still greater size is being constructed, and we learn that the American Sugar Refining Company, of San Francisco, has just had a vacuum pan erected composed of twelve cast-iron hoops; it is 46 feet in height and 18 feet in diameter, and turns out in from 2½ to 3 hours about 3,500 cwt. of *masse cuite*. The heating portion consists of 72 coils; the condenser is 9 feet in diameter and 29 feet in height.

The application of cast-iron plates or rings in the manufacture of all kinds of vats seems to be more general in America than in Europe, and is said to be very economical and to work satisfactorily.

FOREIGN OPINIONS ON THE SUGAR CONVENTION.

As the time approaches for the resumption of the deliberations of the Commission, the opponents of the Convention begin to bestir themselves. A brochure, entitled "The Beginning of the End" has appeared in Germany, following to some extent the line laid down by the larger pamphlet of Mr. Görz, to which we called attention in the *Sugar Cane* for November, 1888, page 605. The author argues that the beetroot sugar industry would never have been able to attain its present position if it had not been protected by the State. Under this protection, granted by the State at considerable sacrifice, the consumer of sugar in all countries has largely benefited by the reduction in prices caused by the competition of the beet with cane sugar, which competition was only rendered possible by the help afforded by the State. Without this the consumer would still be paying the old high prices. The Convention proposes then to abolish all the special advantages which have, so to speak, created the beetroot industry, and to reduce the latter to a regime under which it never would have sprung up, and under which it must now perish before its rival, the sugar cane. The Convention therefore, if ratified, will be the "beginning of the end" of the beet sugar industry.

The anonymous author proceeds to sum up the declarations made by various Chambers of Commerce and unions of sugar manufacturers, and decides that the adversaries of the Convention are in the majority, and that the only beet sugar manufacturers who would view without regret the abolition of the premiums are those who have not made any. In our opinion, the authoritative mouthpieces of the classes most interested, whether in the press or in the Reichstag, cannot fairly be said to hold the views enunciated in this brochure. Up to now, they have contented themselves with emphasizing the condition that the fullest guarantees must be given for the proper execution of the Convention and the complete suppression of premiums by all the signatory Governments in their respective countries. Otherwise they do not appear unfavourable to the Convention. It is, of course, quite open to the opponents of the Convention to insinuate that the parties in question foresee the impossibility of the utter exclusion of premiums, and hence are politic enough not to commit themselves to needless opposition to the avowed determination of the German Government.

The French *Sucrerie Indigène* does not think that any serious opposition to the Convention can be expected in Germany, but adds : —“Let our opposition be more energetic. The interests which we have at stake, and the abstention of such important countries as the United States and Brazil, lead us to hope that our Governments will still leave us free to develop our sugar industry by means of the legislation inaugurated in 1884.”

The *Prager Zuckermarkt*, in a long and carefully written article, declares its belief that England's policy in this matter is a well-matured scheme for ruining, in favour of her colonies and without any sacrifice on her part, the weaker beetroot sugar industry and says that the most interesting feature in this policy is the endeavour to bring this ruin about by the help of the beet producing countries, whose interest she is conspiring against. It is no platonic outburst of veneration for the principle that all premiums are morally and economically vicious; it is rather a carefully planned action in the big style of the government of a people which has always been credited with a specially keen perception of its own interests, the pressure by whom if ideal aims seems in this case to be totally out of the question. The article concludes:—“Finally, we must point out that it is not only a question of the loss to the manufacturers of the premiums on the quantity exported, but also of raising the price to the inland consumer in an equal degree, the two factors together involving a sum of about 9,000,000*fl.* (£750,000). The entrance of Austria-Hungary into the Convention means for its sugar industry the loss of its export, the ruin of a great part of its industrial centres, the gradual extinction of the remaining portion, and its agriculture and everything depending on it.”

We cannot but be struck with the remarkable contrast between these pessimistic utterances, and the activity displayed in the erection of new factories in Germany and especially Austria-Hungary, which it has fallen to our lot to chronicle during the past few months.

THE LONDON WORKMEN'S ANTI-SUGAR-BOUNTY
ASSOCIATION ON SIR T. H. FARRER'S PAMPHLET,
"THE SUGAR CONVENTION."

The London Workmen's Anti-Sugar-Bounty Association have had before them for some days a new book by Sir Thomas H. Farrer, bearing on the cover the device of the Cobden Club, entitled "The Sugar Convention." This book commences with ten letters, six of which are old friends that appeared in *The Times* last autumn. The last four letters have only just shown their faces to the world. Great pains have been taken with every one of them, and their object has been to discredit the action of Her Majesty's Government in the endeavour to restore an important industry to its proper and natural channels. As for the importance of the sugar trade, we need only refer to Letter II., page 12, where it is admitted that the United Kingdom consumes sugar to the tune of thirty millions sterling per annum. It is about one-third the cost of our daily bread. It must therefore be obvious that the lives of a very large number of our hard working fellow countrymen, and the lives of their wives and children, must be affected for good or for evil by the success or the failure of the efforts which Her Majesty's Government have been making to defeat an injustice that dwarfs and ruins the useful occupation that sugar operatives are engaged in. As members of the Executive of the London Workmen's Anti-Sugar-Bounty Association we feel it to be our duty to notice this renewed attempt to defeat our hopes. We are hard working men with very little leisure, whilst our adversary appears to enjoy more than he knows how to turn to good account. In looking over the leaves of his book, and examining their headings and margins, we feel inclined to inquire "*cui bono*" is all this mass of printed matter? We are not even hindered from asking this question by the great authority that pronounced the six letters published in 1888 to be "weighty."

A number of pilot balloons have been sent up. Paragraphs notifying the advent of this book have appeared, in much the same fashion as Thackeray has amusingly described the approaching *début* of a new singer. The coming meteor, if it did not denounce "the fall of sceptres and of crowns," was hoped by some to trip up a ministry. But notwithstanding the respectable name of its author, and the much greater name on the same cover, it is not in the least likely that

voters in any appreciable number will read this book. We know their ways. In all probability the fate of the book is before long to be covered with dust and cobwebs on the shelves and in the cupboards of many a workmen's hall. We hope the controversy will meanwhile have been settled in our favour, and all differences of opinion on the subject forgotten.

In Letter II., page 11, will be found a passage from an official memorandum presented by Mr. Chamberlain, in August, 1881, giving that statesman's estimate of the effect of a countervailing duty, which about that time was suggested. This official memorandum very clearly showed the objections to that course. But no one now asks for countervailing duties, and there is no connection between them and the policy of the Convention. Our opponent has no occasion to harrow our feelings with the troubles of Custom House officials whose heads have been turned by the worry of adjusting discriminating imposts. We are now discussing an agreement between a number of sugar-producing and consuming States to mutually exclude from all their markets any sugar that carries the bribe of the bounties in the sack's mouth.

It cannot be less legitimate and advisable to combine in such "exclusive dealing" than it is to prohibit the introduction of merchandise intended to undersell our manufacturers by the use of fraudulent trade marks. Many of the arguments in the book before us, for instance in Letter VII., page 38, where the Chancellor of the Exchequer is informed that he will have to show that free trade does not mean free imports, might be plausibly linked together to convince us of the unwisdom of prohibiting commodities that are intended to deceive, and the same catalogue of objections would apply. Unhappily, "the evil that men do lives after them" and is never "interred with their bones." Every wrong that has ever existed in this world has never been uprooted without considerable damage, but the tedious recapitulation of possible losses and inconveniences has never proved to be a sufficient objection to the departure from a rotten system and the adoption of a sound one.

The missing link in all Sir Thomas Farrer's arguments, "Tenth or ten thousandth breaks the chain alike," is that he does not seem to understand that bounties will not continue to be paid upon sugar that cannot be sold in the great British market. The Convention will certainly kill the system as soon as it comes into action. It is absurd

to try to throw sand into people's eyes, and to tell us that we shall be depriving ourselves of large sources of supply, that will find their way to other markets, and thus raise the price of this necessary of life to our own people. There are no markets to take this bounty-fed sugar that are not saddled with tariffs that would neutralize the bounty.

We may, therefore, dismiss from our minds any warning that the prohibition of bounty-fed sugar will lessen our supplies, which is a mere cobweb barrier against returning to a natural state of things.

We trust that the public will not be misled by the paragraph in Letter VII., page 40, which appears to us to make an erroneous statement in arguing that the Convention prohibits the importation of all sugar, whether bounty-fed or not. On page 39, the same paragraph gives a quotation from a memorandum of Baron de Worms', stating that a meeting of certain Trades Unions expressed its gratification that the delegates assembled at the International Conference on the Sugar Bounties had unanimously signed the protocol excluding from their respective markets all bounty-fed sugar. It is clear from this that only bounty-fed sugars were meant to be dealt with.

We cannot agree with the view taken by Sir Thomas H. Farrer in Letter VIII., pages 52 and 53, that the German Government were deliberately jockeying ours, in withdrawing their present of cheap sugar (by which is meant the bribe of the bounties), and at the same time keeping their rivals out of our market, and retaining their own hold of it. How can this be when the whole world will have access to our markets?

It is impossible for us to discuss further the arguments advanced by Sir Thomas H. Farrer in the space allotted to a letter. It is quite plain to us that he is actuated by a strong animus against the policy of the Government. This is easily discerned by his opening remarks, in which he describes the Convention as the most bungling piece of work he had ever seen turned out of a Government workshop.

Thanks to board schools and cheap newspapers, working men are quite capable of understanding the broad principles of this question. Metaphysics are not necessary to enlighten us. We know it must be right to let every trade have fair play, and that each might in its turn be greatly injured by the application of the bounty system. This system may—or may not—affect us as consumers. We have not the opportunity of making the calculation, but we prefer to trust to

nature and to justice. We are sure that our affairs will go right if these are not interfered with. We are quite convinced that no paltry saving upon our personal consumption, even supposing there be any (which is questionable), will be any compensation for the loss to the community of industries, large or small, that give employment to our fellow-citizens.

(Signed) DANIEL GIRDWOOD,

Thames Sugar Refinery, Silvertown, Essex;

President of the London Workmen's Anti-Sugar-Bounty Association, embracing all the operatives of the surviving four refineries in London and in London suburbs, viz.:—Messrs. Henry Tate & Sons, Silvertown, London, E.; Messrs. Abram Lyle & Sons, Silvertown, London, E.; Messrs. David Martineau & Sons, St. George's, East; Messrs. L. Cowan & Sons, Hammersmith.

16th March, 1889.

Thames Sugar Refinery, Silvertown, London,

16th March, 1889.

To the Right Hon. THE BARON H. DE WORMS, Whitehall.

Sir,—The members of the London Workmen's Anti-Sugar-Bounty Association most respectfully beg to call your attention to the enclosed remarks upon the book recently published by Sir Thomas Farrer, with the object of creating prejudice against the Anti-Sugar Bounty Convention that you have so ably conducted.

Our Association feels that this is a very critical time for the cause we have at heart, as we presume that Parliament must be asked to ratify the Convention before the Easter recess.

The enclosed remarks have been written in the earnest hope that, coming as they do from the class most deeply interested in the controversy, and including a large number of our fellow-countrymen, what we have to say on the subject in answer to an active and prejudiced opponent will receive some attention, and may possibly influence the opinions of others who have more power in deciding the issue than we have.

If in your judgment you come to the conclusion this may perhaps be the case, and that our remarks be of any service, our Association begs you to deal with them in the manner which you deem may perhaps benefit the cause.

Our Association retains a copy, in the event of your reply to this giving us occasion to make use of it.

I beg leave to remain, with great respect,

Your obliged and obedient servant,

DANIEL GIRDWOOD, President.

To which the subjoined reply has been received:—

Downing Street,

March 19th, 1889.

Dear Sir,—I am directed by Baron Henry de Worms to acknowledge the receipt of your letter of the 6th, enclosing a copy of the reply of the London Workmen's Anti-Bounty Association to the criticisms in Sir Thomas Farrer's pamphlet on the Sugar Bounty Convention. Having regard to your practical knowledge of the subject, Baron de Worms does not doubt that your views, in demanding the abolition of the sugar bounties, will find general favour among the working classes of the country, who, he believes, will resist equally with yourselves the theories which Sir Thomas Farrer presumes to advance as representing their opinions. Baron de Worms feels that the welfare of the industrial community will best be served by abolishing the restrictions imposed on our sugar trade by the bounty system, so as to enable them to compete on equal terms with the foreigner. At present this is impossible, and as there is no guarantee that the State subsidies now given to foreign sugar producers may not be extended to other branches of commerce, the necessity for effectually checking the system is obvious and imperative.

Yours obediently,

W. T. LAWRENCE.

DANIEL GIRDWOOD, Esq.

Jean de Lery, who went in 1556, to the Rio de Janeiro, in Brazil, says he found everywhere near that river a great quantity of sugar canes; and it is certain that they could not be planted by the Portuguese, as they were not settled in those parts until long afterwards.—Dr. Moseley on Sugar, 1799, page 25.

THE SUGAR OPERATIVES AND THE CONVENTION.

At a meeting of the London Workmen's Anti-Sugar-Bounty Association, held at St. George's-in-the-East, on Saturday evening, 9th March, 1889, the following resolution was unanimously adopted, viz. :—

That the Secretary of the Association should be requested to write a respectful letter to the Prime Minister, most sincerely thanking him and all the members of the present Government for their statesman-like and generous view of the injustice inflicted upon us and our employers by the action of the foreign bounties upon sugar.

We feel all the more grateful because we are well aware that although the trade we follow is important, yet our numbers and influence, both of masters and men, are not sufficiently great, amongst the vast commercial and manufacturing interests of this country, to offer any political compensation for the prejudice that active misrepresentation is endeavouring to raise against the policy of restoring our industry to natural channels.

We humbly beg to remind the Prime Minister and the Government how necessary it is that no time should be lost in introducing into Parliament the Bill for enabling the administration to carry out the provisions of the Sugar Convention.

We understand that the Conference will be resumed at the end of next month, and that the success of the negotiation depends upon Her Majesty's Government being ready to inform the Delegates, as soon as they assemble, that Parliament has passed a Bill giving effect to the engagement entered into by this country under the terms of the treaty. Many foreign States are waiting for that declaration, and it is fairly expected by them, and by the contracting Powers, that the United Kingdom, which took the initiative in the negotiations, should be the first to give legislative sanction to the stipulations agreed upon by Her Majesty's Government.

The trade is anxiously waiting, and we are well assured that it is prepared to take considerable steps in the direction of expansion, so soon as Parliament has set its seal upon what the Government has already done.

We venture to hope that the Prime Minister, and all the members of Her Majesty's Government, will kindly forgive our importunity upon a subject which is of such vital importance to a number of their

fellow countrymen. This is to us a supreme moment, when we feel that we have reason to hope that the industry we follow will not be dwarfed and crippled much longer by the baneful influence of the bounties. Life is but short for every one of us, and many amongst our number are considerably past middle age, but there is a younger generation growing up, and following their fathers' footsteps, and we hope that they, as well as ourselves, in experiencing the undoubted benefits to every branch of the sugar trade that must result from the defeat of all meddling and artificial influences, will always remember that this has been accomplished by the exercise of great skill and courage and perseverance on the part of Her Majesty's Government.

We are, on behalf of the executive of the London Workmen's Anti-Sugar-Bounty Association,

Your obedient servants,

(Signed) DANIEL GIRDWOOD, President,
Silvertown, E.

(Signed) JAMES CONJUITE, Hon. Sec.,
109, Cable Street, St. George's, E.

9th March, 1889.

To the Most Noble THE MARQUIS OF SALISBURY, K.G.,
Whitehall.

The following letters have been addressed to Baron de Worms and the Chancellor of the Exchequer :—

Thames Sugar Refinery, Silvertown, London,
9th March, 1889.

To the Right Hon. THE BARON H. DE WORMS, Whitehall.

Sir,—We are instructed by the London Workmen's Anti-Sugar-Bounty Association, which embraces all the operatives of the four surviving sugar refineries of London and of London suburbs, to hand you the enclosed copy of a resolution of our Association, which has this day been adopted, and which we have addressed to the Marquis of Salisbury.

This is such a critical moment, as affects not only our future but also the future of many of our sons, who naturally are following in our steps, that we entreat you to kindly indulge us by giving your attention to the enclosed copy of our resolution.

We have all read with great pleasure your utterances at the recent banquet at Liverpool, and we believe your arguments are unanswerable. They very much relieve our anxiety, occasioned by a number of indications that our vital interests will be endangered by political and party considerations.

We very much deplore that politics should enter into and confuse a question which is purely industrial and economical, and we depend very much upon your ability and thorough knowledge of every branch of the subject, to prevent it from being obscured and misguided by the false lights of a gang of wreckers.

On behalf of our Association, we are, with great respect, and sincere thanks,

Your obedient servants,

(Signed) DANIEL GIRDWOOD, President,
Silvertown, Essex, London, E.

(Signed) JAMES CONJUITE, Hon. Sec.,
109, Cable Street, St. George's, E.

9th March, 1889.

To the Right Honourable the CHANCELLOR OF THE EXCHEQUER,
Whitehall.

Sir,—We are instructed by the London Workmen's Anti-Sugar-Bounty Association, which embraces all the operatives of the four surviving sugar refineries of London and of London suburbs, to hand you the enclosed copy of a resolution of our Association which has this day been adopted, and which we have addressed to the Marquis of Salisbury.

This is such a critical moment, as affects not only our future but also the future of many of our sons, who naturally are following in our footsteps, that we entreat you to kindly indulge us by giving your attention to the enclosed copy of our resolution.

We hope there may be found some excuse for our importunity, because some of us had the pleasure of hearing your address on the 30th January, at the Stratford Town Hall,* and were greatly encouraged by your declaration that you would defend the principles of the Convention. We sincerely thank you for that valuable utterance at Stratford, which has very much relieved our anxiety, occasioned

by a number of indications that our vital interests are about to be overshadowed by a political party struggle, when Parliament is asked to ratify the Convention.

We very much deplore that politics should enter into and confuse a question which is purely industrial and economical; and we hope and trust that you and your able colleagues will be able, when the debate comes on, to defeat every effort that will be made to throw sand into the eyes of the public.

On behalf of our Association, we remain, with great respect,

Your obliged and humble servants,

(Signed) DANIEL GIRDWOOD, President,
Silvertown, Essex, London, E.

(Signed) JAMES CONJUTE, Hon. Sec.,
109, Cable Street, St. George's, E.

The following reply has been received from Baron de Worms:—

Downing Street,

12th March, 1889.

Dear Sir,—In acknowledging your letter of the 9th, and the enclosed resolution, I beg that you will convey to the members of the London Workmen's Anti-Bounty Association my cordial thanks for their kind personal expressions. Such abundant evidence has been placed before me of the injurious effects of the bounty system, that I am convinced the Government is pursuing a course conducive alike to the interests of capital and labour in striving to suppress it. Thanks also to the working-men themselves, I believe the general public, realizing how great is the present damage to our trade, caused by the bounty system, and how seriously the matter is fraught with unwelcome possibilities, entertain a strong natural desire to settle the question as prescribed by the International Sugar Convention, signed last year by the various Powers. Moreover, both the number and nature of the different resolutions passed by the Trades' Union Societies, urging the abolition of the bounties, shew how far the subject is removed from the domain of party politics, and how closely it concerns the welfare of many branches of industry.

Yours faithfully,

H. DE WORMS.

DANIEL GIRDWOOD, Esq.

FIBRE CULTIVATION IN THE BAHAMAS.

The following letter on this subject, from Sir Ambrose Shea, the Governor of the Bahamas, appeared in *The Times* of March 9th:—

Sir,—The approaching changes in the economic conditions of these islands, and the causes that underlie them, are of sufficient general interest to make them worthy of public attention, which, I trust, they will obtain by the publication of this letter in *The Times*.

This colony has been no exception to the general non-progressive condition of the West India Islands for many years. The trade and industries dragged on without indication of better things, and the most favourable anticipations of the people were limited to the hope that matters would grow no worse. This was our position here when, about a year ago, I called the attention of the Legislature to the grave hazards of an adherence to the old methods, and urged the necessity of active measures to bring new industries into life. This proposal was promptly responded to, and a committee appointed to consider the question made a report, from which I take the following suggestive description of the precarious condition of the colony:—

Viewing the present depressed condition of the colony, as referred to in His Excellency's speech, and considering that its chief staple exports are fruit, salt, and sponge,—the first-named precarious, as being liable to so many vicissitudes—the salt industry languishing, owing to the United States markets being practically closed against it by its excessive tariff charge, and that the sponge beds are showing unmistakable signs of exhaustion, the committee feel that the time has arrived for the Legislature to interpose its aid in endeavouring to call into activity any of the latent resources of the colony, which, owing to the absence of capital and other causes, now lie dormant.

There was no question of the accuracy of the statements of this report or the urgency of the situation, and the issue was an Act, unanimously adopted, to give substantial encouragement, for a limited period, to the cultivation of the sisal fibre plant. At once the project secured the approval and confidence of the public, and inquiry has since given evidence of the strong grounds on which this industry will rest. Some fitful efforts had before been made in this direction from time to time but without result, while the plant was popularly regarded as a noxious weed which bade defiance to all efforts to expel it. The rapid awakening to a due sense of its great commercial value

is most remarkable. The cultivation has now become general, and its efficacy as the means of raising the colony into a position of independence is universally accepted. Some small shipments of the fibre have been made to the United States, where they obtained the highest prices, and the samples sent to England and the Dominion of Canada are pronounced equal to "very good Manila for rope-making." On the score of its quality we have nothing to desire, and when an article of such staple value is a natural product of unfailing growth, resisting as it does the influences of drought and all other adverse contingencies to which agricultural operations are usually liable, we have, in the combination of these concurrent facts, a case of assured economic advantage available to all our people to which ordinary experience will scarcely find a parallel illustration. These attractions are further enhanced by the increasing demand for fibre of this high character, the consumption in the United States having progressed during the past four years at the rate of 25 per cent. per annum, and, at the present moment, there are offers to purchase in this market to the extent of 200,000lbs. during the present year at highly remunerative prices. To these offers, however, there must be but a limited response, for we shall require a time for preparation for extensive demands. Neglect and persecution have hitherto been the lot of this plant, and it must be subjected to new conditions, which is now being done, having regard to its recognized value, before it can be got into productive working on a large scale. Meanwhile, and until after two years, the result will be limited, but then the present extended planting will yield a substantial harvest, which will be of continuous increase as operations proceed. It is also one of the conditions of this fibre plant that there will be from 15 to 20 annual crops without any cost but the small charge for weeding. The soil and climate of the Bahamas are peculiarly adapted to the growth of high-class fibre, which has also the singular quality that it chooses the least generous ground for its best production. Doubtless the growth is not confined to Yucatan and the Bahamas, and may be found in other places in great apparent luxuriance, but it is often valueless from the absence of fibre in the leaf, showing the need of the special conditions which adapt this colony to the profitable cultivation of the plant. It would appear as if nothing desirable were left unprovided in the capabilities and incidents of this extraordinary agent, which seems destined to vitalize the energies of the people and lead them to a high level of material and social advancement.

At Yucatan we now learn that this industry has been for some years in existence, and has acquired a position of rare prosperity. From the produce of 29,000 acres in 1887 the export was \$6,176,000, equal to about £44 sterling the acre, and for the year 1888 the assumed quantity of land under crop, 32,000 acres, is believed to have given an export of nearly \$8,000,000, but I have not yet had the official returns. In six years it is thought this export will be doubled. The cost of producing the fibre in Yucatan is not over two cents, or one penny, the pound, while the selling price during 1888 was from eight to 11 cents, the latter being the latest New York quotation. We are fully as favoured in these islands as at Yucatan for the purposes of this industry, and I believe our fibre to be of a better description. In the consideration of the question I am not assuming that present values are to continue to be maintained, but the margin for decline is large within the limits of profitable results, and this colony has advantages that will keep it well abreast of any competition with which it may have to contend.

In presence of all these circumstances it will be readily understood that the depression of a year ago has given place to a pervading spirit of confidence in a prosperous future. The operation of local efforts, even if unaided, will doubtless mark a great advance; but we have room for outside enterprise, and the opportunity for successful investment is unique. The elements of security and promising results are associated in a degree that almost wholly excludes the contingency of failure or loss, and I am writing under a full sense of the responsibilities of my position, which forbids the employment of florid or exaggerated statements. But I would advise that no practical step be taken in connection with this enterprise until a thorough examination has been made on the spot into every circumstance that should enter into a careful business calculation. The local Government will regard the advent of strangers to engage in our new industry with much interest and favour, and it should count for something that their undertakings will be safeguarded by British laws and administration, of which the value will be best appreciated by those whose experience may have been gained outside the limits of our national jurisdiction.

I have the honour to be, Sir,

Your most obedient servant,

A. SHEA.

Government House, Nassau, N.P., February 2.

REPORT UPON THE EXPERIMENTS AT DODDS
(BARBADOS), FOR 1887-88.

BY MESSRS. J. B. HARRISON AND J. R. BOVELL.

(Continued from page 144.)

*Summary of Conclusions arrived at on the Action of the Manures
during the Years 1885-1888 inclusive.*

1. The addition of readily available nitrogen to mineral manures produces a large increase in the weights of canes grown, but excessive dressings (over 3 cwts. of sulphate of ammonia per acre) cause a marked decrease in the richness and purity of the juice.

2. Upon the soil and under the climatic conditions existing at Dodds during the years 1885, 1886, 1887 and 1888, nitrate of soda was decidedly inferior to sulphate of ammonia as a source of nitrogen for the sugar cane.

3. The addition of superphosphate in moderate proportions to manurings of nitrogen and potash causes a very great increase in the yield of canes and in the available sugar obtained in the juice per acre.

4. The addition of superphosphates in quantities beyond that capable of supplying about 75 lbs. of "soluble phosphates" to the acre (equivalent to about 16% of "soluble phosphates" in commercial sugar cane manures when applied in the ordinary manuring of one ton in five acres) does not produce a corresponding increase, and if applied in very high proportions may even reduce the produce below that obtained from manuring with nitrogen and potash only.

5. The addition of potash to manurings of superphosphate and nitrogen may produce in soils at all deficient in available potash, large increases in the yield of canes and especially in the available sugar in the juice per acre.

6. The presence of an excess of potash in the manures does not injuriously affect the purity of the juice either by increasing the glucose or appreciably the amount of potash salts contained in it.

PART III.

EXPERIMENTS WITH DIFFERENT VARIETIES OF THE SUGAR CANE.

These experiments were carried on at Dodds and at Little Island, an estate the property of W. T. Armstrong, Esq., Magistrate for District F, who with great kindness and entirely at his own expense, carried out with us a series of experiments upon some of the more promising varieties, arranged similarly to one series of those at Dodds. Between the two stations the differences are both in soil and climate, the latter due to altitude, Dodds being 210 feet, and Little Island 1,030 feet above the sea level. The climatic differences are in the mean temperature, and in the amount, etc., of the rainfall; at Dodds these being during the experiments 81°F., and 70·72 inches, and at Little Island 75°F., and 112·16 inches: at the latter place the canes are planted four feet apart, giving 2,178 plants to the acre, whilst at Dodds they are planted six feet apart or at the rate of 1,210 plants per acre. The soil of Little Island is also naturally more fertile than at Dodds. At the latter station the fields used for these experiments were of equal fertility and the best on the estate. The following detailed analyses of the soils were made during the experiments.

Chemical Analysis.

Air dried soils, stones removed.

	Dodds.	Little Island.
Moisture	11·988	... 12·117
Combined water	6·059	... 9·612
1 { Humus	·520	... ·800
{ Root residues (organic matters) ..	2·289	... 2·946
Silica	·001	... ·138
Phosphoric anhydride	·073	... ·133
Sulphuric anhydride	·120	... ·137
Nitric anhydride ...	·003	... ·022
Chlorine	·014	... ·004
Alumina	3·667	... 6·017
Ferrous oxide	·216	... ·720
Ferric oxide	4·320	... 7·600
Manganic oxide	·250	... ·150
Calcium carbonate	4·432	... 3·295
Calcium oxide	2·558	... ·535
Magnesia	·756	... ·288
Potash	·097	... ·116
Soda	·012	... ·003

Soluble in cold hydrochloric acid.

Soluble in boiling hydrochloric acid.	Silica	·444	....	·538
	Phosphoric anhydride	·125	....	·063
	Alumina	6·115	....	10·767
	Ferric oxide	2·160	....	1·320
	Manganic oxide	·330	....	·400
	Calcium oxide	·420	....	·084
	Magnesia	·054	....	·314
	Potash	·145	....	·171
	Soda and loss in analysis ..	·228	..	·132
Insoluble sand and clay.	Silica (soluble in alkalies)	28·708	..	13·153
	Silica (combined).	1·297	....	1·079
	Silica (quartz sand)	16·856	....	17·418
	Ferric oxide	·880	....	·600
	Alumina	4·695	....	9·100
	Potash	·048	....	·101
	Soda	·119	....	·127
		100·000		100·000
1 Containing Nitrogen		·101		·226

Mechanical Analysis.

	Dodds.	Little Island.
Stones removed before analysis	5·74	... 2·00

Fine soils. Air dried.

Moisture	11·99	....	12·12
Coarse gravel .....	..	....	·21
Fine gravel and very coarse sand .	30·70	....	10·15
Coarse sand	17·80	....	·69
Fine sand.....	7·92	....	32·16
Very fine sand	13·82	....	8·00
Clay and fine soil.....	17·77	....	38·67
		100·00	100·00

The varieties at Dodds were cultivated in plots each containing 120 plants of a variety, arranged in parallel rows, and occupying one tenth of an acre. Duplicate plots were used for each variety with one

exception, that of the so-called Barbados native cane, probably the variety of cane introduced originally into the West Indies from Brazil, and the cultivation of which has been entirely superseded by that of the Bourbon or Otaheite cane. Our objects at Dodds in this portion of our experiments were three; first, to compare the varieties when cultivated under exactly similar conditions; second, to notice the effects of two different systems of manuring upon each of them; and, third, to obtain, if possible, fertile seed from the cane, as the chances for the seed to be fertilised are much greater where considerable numbers of canes of different varieties are growing side by side, than where, as is usual in the West Indies, one variety only is being cultivated. One plot of each of seventeen varieties were upon soil which had been manured by green dressings grown upon it and turned in, the young canes receiving a few weeks after planting a dressing of Ohlendorf's Early Cane manure at the rate per acre of $2\frac{1}{2}$ cwts., and in June, one of $2\frac{1}{2}$ cwts. of Dissolved Peruvian Guano per acre. The duplicate plots were on soil manured before the canes were planted with pen manure at an estimated cost of \$24 per acre, and received in June $4\frac{1}{2}$ cwts. per acre of Dissolved Peruvian Guano. A comparison of the yields obtained on these two series of plots should assist in elucidating the important question:—Cannot the very expensive system of manuring with pen manure be with advantage changed for a much less expensive one of manuring with green dressings and suitable artificial manures applied at an early stage of the canes' growth? In Mr. Armstrong's series of experiments the canes were similarly arranged to ours, manured with pen manure and later on, with the Dissolved Peruvian Guano, and are, therefore, comparable best with Series 2 of the Dodds' ones. The Dodds' canes were reaped on March 19th and following days, at which time most of the varieties which, as a rule, appear at present, to arrive at maturity in a shorter time than the Bourbon, were ripe. Half the plants on each plot, excluding those growing on the head rows, were weighed, and crushed at the Bushy Park Works. The canes grown at Little Island were reaped and crushed there on May 1st. Tables 19 and 20 give the field and mill results; Tables 21, 22 and 23 the compositions of the canes, cane juice and megass obtained in Series 1, at Dodds; Tables 24 and 25 the field and mill results on Series 2; whilst Tables 26 and 27 give the field and mill results of the Little Island experiments:—

APRIL 1, 1889.

THE SUGAR CANE

TABLE No. 19.
RESULTS OF THE REAPING OF THE VARIETIES OF CANES. SERIES 1.

NAMES OF THE VARIETIES.	Number of Canes.		Weight per Acre of						Weight in Lbs. of one.			Decrease upon the Bourbon in cwt. of	
	Per Acre.	Per Clump.	Produce.			Cane Tops.			Cane Top.	Cane.	Clump.	Produce.	Canes.
			Tons.	Owts.	Tons.	Owts.	Tons.	Owts.					
Bourbon	13,632	11.2	43	5½	5	16½	37	8¾	.93	6.1	69.2	133	131.7
Purple Transparent	15,621	12.1	36	12½	5	15½	30	17	.89	4.7	57.1	8	14.7
Purple Mauritius	17,021	14.1	42	17½	6	3¼	36	14	.88	4.8	67.9	126.5	100.7
Keni-Keni	11,172	9.2	36	19	4	11	.32	8	.91	6.5	60.1	216.5	207.2
Ribbon	14,742	12.2	32	9	5	7½	27	1½	.82	4.1	50.1	103.7	166.5
White Transparent	14,842	12.2	35	1¼	6	½	29	11½	.91	4.4	53.8	304	296.2
Bouronappa	18,755	15.5	28	1½	5	9½	22	12¼	.65	2.7	41.8	185	173.2
Elephant (Barbados)	10,587	8.7	34	½	5	5	28	15½	1.22	6.1	53.2	308.5	279
Sacuri	18,876	15.6	27	17	4	13½	23	3½	.55	2.7	42.9	147.7	165
Norman	18,106	14.6	35	17½	6	14½	29	3	.83	3.6	53.9	258	246.2
Naga	17,060	14.1	30	7½	5	5	25	2½	.69	3.3	46.5	157	187.7
Demerara	17,908	14.8	35	8½	7	7½	28	1	.92½	3.5	52.1	256	241
Illili	21,700	17.9	30	9½	5	1¼	25	7¼	.52	2.6	47.	233.7	269.7
Salangore	18,956	15.6	31	11¾	7	12½	23	19	.90	2.8	44.3	365	321.7
Elephant (Jamaica)	9,800	8.1	25	0	3	13	21	7	.83	4.9	39.5	257	291.7
Barbados Native	17,025	14.5	30	8½	6	11½	23	17	.84	3.	44.1	314.5	330.2
Patramic	17,948	14.8	27	11½	6	13	20	18½	.83	2.6	38.7	429.	390.7
Manuri	18,150	15	21	16	3	18	17	18	.48	2.2	33.1		

TABLE No. 20
RESULTS OF THE CRUSHING OF THE VARIETIES OF CANES. SERIES I.

NAMES OF VARIETIES.	167° F. Imperial Gallons of Juice per acre.	60° F. Density Baumé.	Juice by Mill per cent.	84° F.		Sucrose in Cane per cent.	Lbs. per Acre of			Decrease per Acre upon the Bourbon of	
				Lbs. per Imperial Gallon of			Sucrose in		Available Sugar in Juice.	Available Sugar.	Profit.
				Sucrose.	Glucose.		Cane.	Juice.			
Bourbon	4,688	10.7	60	1.834	.072	13.96	11,716	8,600	8,093	Lbs.	\$ cts.
Purple Transparent	3,675	21.1	57.4	1.983	.030	14.83	10,247	7,283	7,117	976	12 20
Purple Mauritius	4,454	10.6	58.1	1.678	.077	11.89	9,765	7,463	6,963	1,130	14 12
Keni-Keni	4,230	10.2	62.3	1.733	.080	13.14	9,405	7,330	6,822	1,271	15 89
Red Ribbon	3,539	14.1	61.1	1.928	.040	14.04	8,517	6,823	6,540	1,553	19 41
White Transparent	3,282	11.1	54.6	1.944	.055	13.68	8,905	6,379	6,110	1,983	24 79
Bouronappa	3,126	10.6	66	1.843	.052	14.11	7,150	5,762	5,516	2,577	32 21
Elephant (Barbados)....	3,595	10.3	59.6	1.620	.070	12.57	8,102	5,823	5,449	2,647	33 09
Sacuri	2,734	11.6	57	2.041	.048	15.09	7,837	5,581	5,388	2,705	33 81
Norman	3,438	10	56.3	1.587	.058	11.06	7,222	5,456	5,174	2,919	36 48
Naga	2,891	11.2	55.2	1.840	.049	12.19	6,861	5,319	5,105	2,988	37 35
Demerara	3,203	10.5	54.6	1.697	.074	12.17	7,647	5,436	5,080	3,013	37 66
Hilli	3,126	10.1	58.7	1.668	.054	12.39	7,046	5,415	4,961	3,132	39 15
Salangore	2,969	10.7	59.3	1.772	.063	13.97	7,494	5,261	4,882	3,211	40 13
Elephant (Jamaica)	2,500	10.2	56.2	1.717	.064	12.66	6,050	4,293	4,053	4,040	50 50
Barbados Native	2,513	10.4	56.5	1.529	.073	10.89	5,828	4,301	3,967	4,126	51 57
Batramic	2,109	10.1	48.1	1.681	.062	11.55	5,402	3,545	3,350	4,743	59 29
Manuri	1,796	11.1	48.1	1.811	.062	11.16	4,474	3,254	3,086	5,007	62 59

TABLE No. 21.
COMPOSITION OF THE VARIETIES OF CANES. SERIES 1.
(Arranged in Order of Saccharine Richness.)

NAMES OF VARIETIES.	Water.	Sucrose.	Glucose.	Ash.	Albu- minoids.	Organic Matters.	Fibre.	Nitrogen in Albuminoids.
Sacuri	67.50	15.09	.35	.53	.68	1.40	14.45	(.108)
Purple Transparent	68.88	14.83	.20	.33	.34	1.09	14.33	(.055)
Bouronappa	71.22	14.11	.39	.58	.65	1.04	12.01	(.104)
Bourbon	67.56	13.96	.53	.47	.76	1.83	14.89	(.121)
Salangore	69.00	13.97	.49	.42	.31	2.60	13.33	(.050)
Red Ribbon	69.58	14.04	.27	.45	.24	1.97	13.45	(.038)
White Transparent	67.77	13.68	.42	.64	.28	3.02	14.19	(.041)
Keni-Keni	69.50	13.14	.59	.35	.58	1.42	14.42	(.093)
Elephant (Jamaica)	69.99	12.66	.45	.29	.82	1.36	14.43	(.131)
Elephant (Barbados)	72.42	12.57	.52	.72	.29	1.76	11.72	(.046)
Hilli	70.95	12.89	.38	.68	.65	1.92	13.03	(.104)
Demerara	68.90	12.17	.51	.40	.19	1.72	16.11	(.030)
Naga	71.80	12.19	.32	.48	.27	1.71	13.23	(.042)
Purple Mauritius	68.73	11.89	.53	.72	.63	2.07	15.43	(.101)
Batramic	66.53	11.55	.40	.62	.34	1.60	18.96	(.053)
Mamuri	65.91	11.16	.36	.75	.30	1.83	19.69	(.048)
Norman	67.33	11.06	.39	.35	.30	1.97	18.60	(.048)
Barbados Native	70.89	10.89	.50	.53	.34	2.11	14.73	(.055)

TABLE No. 22.
COMPOSITION OF THE JUICE OF THE VARIETIES OF CANES. SERIES 1.
(Arranged in Order of Saccharine Richness of Canes.)

NAMES OF VARIETIES.	Water.	Sucrose.	Glucose.	Ash.	Albuminoids.	Organic Matters.	Nitrogen in Albuminoids.
Sacuri	78.25	18.84	.44	.19	.13	2.15	(.020)
Purple Transparent	79.43	18.34	.27	.18	.33	1.45	(.047)
Bouronappa	79.80	17.22	.49	.37	.78	1.84	(.125)
Bourbon	79.46	17.03	.66	.24	.58	2.03	(.094)
Salangore	80.00	16.51	.59	.18	.29	2.43	(.047)
Ribbon Cane	79.06	17.87	.37	.18	.10	2.42	(.016)
White Transparent	78.71	17.95	.51	.32	.20	2.31	(.032)
Koni-Koni	80.80	16.15	.74	.16	.29	1.86	(.047)
Elephant (Jamaica)	80.46	15.97	.59	.20	.82	1.96	(.132)
Elephant (Barbados)	81.14	15.15	.65	.06	.19	2.21	(.030)
Hilli	81.48	15.62	.50	.28	.44	1.68	(.070)
Demerara	80.89	15.84	.69	.22	.11	2.25	(.017)
Naga	79.60	17.11	.45	.23	.24	2.37	(.039)
Purple Mauritius	80.76	15.64	.71	.30	.38	2.21	(.063)
Batamic	80.80	15.72	.57	.22	.58	2.10	(.093)
Mamuri	79.70	16.84	.57	.38	.11	2.40	(.017)
Norman	81.76	14.84	.54	.19	.29	2.38	(.047)
Barbados Native	81.46	14.25	.68	.21	.14	3.08	(.023)

TABLE No 23.
COMPOSITION OF THE MEGASS OF THE VARIETIES OF CANES.—SERIES 1.
(Arranged in order of saccharine richness of canes.)

NAMES OF VARIETIES.	Water.	Sucrose.	Glucose.	Ash.	Albu- minoids.	Organic Matters.	Fibre.	Nitrogen in Albuminoids.
Sacuri	53.27	10.11	.23	.97	1.43	.41	33.58	(.228)
Purple Transparent	54.64	10.11	.13	.55	.35	.57	33.65	(.056)
Bouronappa	54.56	8.11	.21	1.01	.43	.34	35.34	(.060)
Bourbon	49.76	9.35	.35	.82	1.04	.45	37.23	(.166)
Salangore	52.98	10.27	.35	.81	.36	2.48	32.77	(0.59)
Red Ribbon	54.65	8.04	.14	.91	.48	1.19	34.59	(0.77)
White Transparent	55.33	8.55	.22	1.04	.38	3.22	31.26	(.061)
Keni-Keni	50.82	8.19	.36	.67	1.06	.63	38.27	(.167)
Elephant (Jamaica)	56.58	8.42	.29	.41	.84	.50	32.96	(.134)
Elephant (Barbados)	59.55	9.29	.36	.82	.46	.51	29.01	(.073)
Hilli	55.99	7.83	.23	1.27	.95	2.17	31.56	(.152)
Demerara	54.26	7.79	.32	.62	.30	1.23	35.48	(.048)
Naga	62.20	6.11	.15	.81	.33	.84	29.54	(.052)
Purple Mauritius	52.05	6.77	.29	1.31	.99	1.75	36.84	(.159)
Batamic	53.32	7.70	.25	.99	.31	.89	36.54	(.049)
Manuri	53.15	5.91	.18	1.10	.48	1.23	37.95	(.077)
Norman	48.74	0.26	.20	.59	.33	1.30	42.58	(.052)
Barbados Native	56.92	6.52	.29	.93	.60	1.39	33.85	(.096)

TABLE No. 24.
RESULTS OF THE REAPING OF THE VARIETIES OF CANES.—SERIES 2.

NAMES OF THE VARIETIES.	Number of Canes.		Weight per acre						Weight in lbs. of ono.			Decrease upon the Bourbon in cwt. of.	
	Per Acre.	Per Clump.	Produce		Cane Tops.		Canes.		Cane Top.	Cane.	Clump.	Produce.	Canes.
			Tons.	Cwts.	Tons.	Cwts.	Tons.	Cwts.					
Bourbon	12,826	10.6	42	12½	6	½	36	12	.76	6.38	67.6		
Ribbon	21,134	17.4	34	7½	6	1½	28	6½	.64	3.00	52.2	164.7	165.7
Purple Transparent	19,360	16.0	37	7½	5	11½	31	16	.64	3.68	58.8	105	96
White Transparent	20,086	16.6	32	11	5	19½	26	14½	.66	3.00	49.5	201.5	197.5
Keni-Keni	12,866	10.6	35	19	4	13½	31	5½	.81	5.45	57.9	138.5	106.5
Mauritius	20,973	17.3	41	13½	6	19½	43	14½	.74	3.70	64.2	19	37.7
Elephant (Barbados)	9,922	8.2	39	½	5	8	33	12½	1.22	7.59	62.2	72	69.6
Hilli	18,070	14.9	33	12½	6	½	27	12	.74	3.42	51.1	180	180
Sacuri	17,343	14.3	28	2	4	8½	23	13½	.57	3.06	43.8	290.6	268.5
Elephant (Jamaica)	13,148	10.8	30	3	3	19½	26	3½	.68	4.46	48.5	249.5	208.2
Demerara	13,470	11.1	30	0	6	1	23	19	1.00	4.00	44.5	262.5	263
Salangore	14,358	11.8	29	19	5	15½	24	3½	.90	3.77	44.7	263.5	248.5
Norman	17,262	14.2	26	12½	4	8½	21	4½	.57	2.77	39.2	339.7	307.5
Bouronappa	16,860	13.9	27	1½	6	0	21	1½	.80	2.80	39	311	310.5
Naga	20,650	17.1	25	2½	5	7½	19	14½	.59	2.14	36.5	360	337.2
Batramic	16,052	13.2	20	14½	4	17½	15	17	.69	2.21	29.4	438	416
Mamuri	18,795	15.5	20	11	4	6½	17	4½	.51	1.93	30	441.5	407.2

TABLE No. 25.
RESULTS OF THE CRUSHING OF THE VARIETIES OF CANES.—SERIES 2.

NAMES OF VARIETIES.	160° F. Imperial Gallons of Juice by per acre.	60° F. Density, Beaumé.	Percent- age of Juice by Mill.	84° F.		Lbs. per Acre of		Decrease per Acre upon the Bourbon of	
				Lbs. per Imperial Gallon of		Available Sugar in Juice.	Available Sugar.	Available Sugar.	Profit.
				Sucrose.	Glucose.				
Bourbon	4,689	10·7	61·5	1·681	·071	7,881	7,384	Lbs.	\$ c.
Ribbon	3,751	11·2	63·8	1·911	·064	7,169	6,808	574	7 17
Purple Transparent	3,751	11·2	50·8	1·898	·067	7,119	6,743	641	8 1
White Transparent	3,439	10·9	61·8	1·989	·047	6,838	6,597	787	9 84
Keni-Koni	4,063	11·0	62·4	1·730	·079	7,030	6,550	834	10 42
Mauritius	4,220	10·5	58·2	1·642	·070	6,929	6,485	899	11 28
Elephant (Barbados)	4,215	9·9	60·	1·574	·068	6,634	6,204	1,180	14 75
Hilli ..	3,907	9·5	67·3	1·568	·062	6,126	5,763	1,621	20 26
Sacuri	2,813	11·4	57·3	1·863	·043	5,241	5,061	2,323	29 4
Elephant (Jamaica)	2,969	10·5	54·	1·697	·062	5,038	4,763	2,621	32 73
Demerara	2,813	10·7	56·3	1·749	·069	4,919	4,630	2,754	34 42
Salargore	3,125	10·4	70·	1·332	·078	4,787	4,422	2,962	37 2
Norman	2,970	10·	69·7	1·512	·046	4,577	4,374	3,010	37 60
Bouronappa	2,507	11·	57·	1·786	·074	4,466	4,188	3,196	38 95
Naga	2,178	11·	53·3	1·817	·069	3,957	3,733	3,651	45 64
Batramic	1,719	10·2	51·2	1·668	·062	2,886	2,697	4,687	58 59
Manuri	1,719	10·4	50·1	1·630	·075	2,802	2,609	4,775	59 69

TABLE No. 26.
RESULTS OF THE REAPING OF THE VARIETIES OF CANES AT LITTLE ISLAND.

NAMES OF VARIETIES.	Number of Canes.		Weight per Acre of				Weight in lbs. of one			Increase or Decrease upon the Bourbon, in cwt. of	
	Per Acre.	Per Clump.	Produce.		Cane Tops.		Canes.		Cane Top.	Cane.	Clump.
			Tons. Cwts.	Tons. Cwts.	Tons. Cwts.	Tons. Cwts.	Tons. Cwts.	Tons. Cwts.			
Keni-Keni	30,492	14.	62 13½	13 2½	49 11	•96	3.64	51.	— 60.5	— 60.5	+ 50.
Purple Mauritius	32,670	15.	69 1	18 0	51 1	1.23	3.5	52.5	+ 61.	+ 61.	+ 80.
Norman	34,848	16.	61 7	14 11½	46 16½	•93	3.	48.	— 93.	— 93.	— 5.5
Bourbon	36,373	16.7	66 0	18 19	47 1	•93	2.9	48.4	....	....	....
Salangore	30,492	14.	59 16½	17 0½	42 16	1.25	3.14	44.	— 123.5	— 123.5	— 85.
Elephant (Jamaica)	17,424	8.	37 18½	7 6	30 12½	•93	3.9	31.5	— 681.5	— 681.5	— 328.5
Sacuri	34,848	16.	39 17	13 12	26 5	•87	1.7	27.	— 523.	— 523.	— 416.
Manuri	19,602	9.	32 2	9 14½	22 7½	1.11	2.6	23.	— 678.	— 678.	— 494.5

TABLE No. 27.
RESULTS OF THE CRUSHING OF THE VARIETIES OF CANES. LITTLE ISLAND.

NAMES OF VARIETIES.	84° F. Imperial Gallons of Juice per acre.	60° F. Density, Beaumé.	Percent- age of Juice by Mill.	84° F. Lbs. per Imperial Gallon of		Lbs. per Acre of		Increase or Decrease per Acre upon the Bourbon of	
				Sucrose.	Glucose.	Sucrose.	Available Sugar in Juice.	Available Sugar.	Profit.
Keni-Keni.....	6,918	11.1	67.5	1.985	.029	13,730	13,430	Lbs. + 2,330	\$ c. + 29 12
Purple Mauritius.....	7,574	10.	71.	1.645	.057	12,460	11,815	+ 715	+ 8 94
Norman.....	6,767	10.1	69.3	1.716	.041	11,610	11,200	+ 100	+ 1 25
Bourbon.....	6,752	10.6	69.	1.716	.048	11,586	11,100	.....	.....
Salangore.....	6,380	9.3	71.	1.507	.064	10,015	9,002	— 2,098	— 26 22
Elephant (Jamaica).....	4,632	10.1	72.4	1.729	.036	8,003	7,754	— 3,346	— 41 82
Sacuri.....	3,463	10.8	63.6	1.855	.033	6,423	6,250	— 4,850	— 60 63
Mamuri.....	3,156	9.9	67.5	1.606	.061	5,067	4,780	— 6,320	— 79 0

At Dodds, in both series of plots, the Bourbon canes have, as regards yields of canes and of sugar, as in 1887, given the best results; in Series 1, the Purple Transparent followed next, but yielded nearly 1,000lbs. less available sugar in its juice per acre, and was itself closely followed by the Purple Mauritius and the Keni-Keni, the individual canes of the last variety attaining the maximum development in this series; in Series 2, the Red Ribbon giving about 600lbs. less available sugar, was next in yield to the Bourbon, and was closely followed by the Purple and the White Transparents, the Keni-Keni, and the Purple Mauritius. In the two series it will be noticed that the order of yield was approximately the same as, and agreed in general with, that of 1887, but with a most striking exception, in the case of the Purple Transparent, a cane which has shown great powers of improvement under careful cultivation. The results on the whole confirm the opinion we expressed in last year's report as to the value for cultivation at Dodds, of the majority of the canes selected by Mr. Morris, two only of which, we think, will justify the planters in experimenting with them, and we believe that experiments made with these, the Purple Mauritius and the Keni-Keni, the former in the drier districts, and the latter in the more seasonable higher districts of the island, would probably be successful.

Reference to the 1887 report will show that under the influence of climate and of continued cultivation all the varieties have improved in their yields of canes, this improvement being least in the Naga, Batramic, and Mamuri canes, and proportionately greatest in the Barbados native, whilst the yield of the best esteemed varieties, previously cultivated in the island, have greatly increased. The same improvement, and in the same manner, is shown in the yield of sugar, with the exceptions of the Naga, Batramic, and Mamuri, which have somewhat deteriorated, and the Purple Mauritius and Norman, which have remained practically the same; this improvement is strongly marked in the cases of some of the previously cultivated canes, and in the case of the Keni-Keni amongst the newly imported varieties.

It will be noticed that in the majority of the varieties the better results as regards yield of canes and saccharine richness of the juice have been obtained on Series 1, the canes on which it was found matured more rapidly than those on Series 2. On the whole, the use of the green dressings and the early cane manure has given more satisfactory results than the heavy dressing of pen manure.

The experiments at Little Island gave by far the most interesting results, the yield of canes per acre there being very great; and two varieties, the Keni-Keni and the Purple Mauritius surpassing in this respect the Bourbon, whilst the Norman gave practically the same. The juice yielded by the Keni-Keni contained, in round numbers, one ton more available sugar per acre than that of the Bourbon, whilst that of the Purple Mauritius exceeded the Bourbon by over 700lbs. The juice of the Keni-Keni was noticeable at this station for its saccharine richness and purity in comparison to that of the other varieties experimented upon there. From the closeness of the planting of the canes, the average development of the single canes was not so great as at Dodds, but the greater number of clumps per acre and in the cases of the Keni-Keni and of the Bourbon, the greater number of canes in each clump, caused the yield of produce to much exceed that obtained there. The great difference found at Dodds and at Little Island in the yields of certain of the varieties show the probability of differences also in the action of the constituents of manures in the lower and higher districts of the island, and it is to be regretted that no manure experiment station is available for the latter. The difference in the yield of the Bourbon at the two places also points out the importance of experiments at Dodds as to whether—the aim of the agriculturist being to obtain the largest possible number per acre of average plants—the distance at which the canes are there planted apart is not somewhat too great for practical purposes.

With regard to the results of the third object of the experiments with the varieties at Dodds, we must, at present, content ourselves by mentioning their success, having obtained the growth of some seventy or more seedlings, self sown in the immediate vicinity of the plots, of which, after some difficulty in protecting them from the sun and wind, being as we found them exceedingly delicate in their nature and very susceptible of injury by the sun and wind, we now have sixty plants under cultivation, showing promise of several varieties.*

The experiments at present being carried on.

The manurial experiments are being carried on in the same directions mentioned in this year's report; the organic nitrogenous constituents,

* Since writing this, a careful examination of the seedlings has been made; there appear to be ten varieties differing somewhat in their characteristics from the varieties cultivated in 1887, and in several instances having in part some of the characteristics of two or more of the varieties.

the precipitated and mineral phosphates experimented upon having been applied at an early stage of the canes' growth. Other experiments are being made upon the substitution of purely nitrogenous dressings in June or July for the complex manures at present in use, the mineral constituents and a portion of the nitrogen been applied in January soon after the springing up of the canes.

The cultivation of the varieties under identical conditions of culture and manuring is being continued at Dodds, whilst at Little Island the canes experimented with this year are being cultivated as ratoons by Mr. Armstrong, an experiment of the greatest importance. The following varieties are at present in course of experimental culture at Dodds :—

CANES OBTAINED IN BARBADOS.

1. Bourbon.
2. Purple Transparent, Purple Violet, or Black Java cane.
3. White Transparent, or Yellow Violet cane.
4. Red Ribbon Cane, Transparent, or Ribbon cane.
5. Elephant cane.*
6. Salangore.
7. Demerara.†
8. Native cane.

CANES GROWN AT DODDS.

9. A Bud Variation from the Naga cane.
10. Seedlings.

CANES OBTAINED FROM JAMAICA.

- | | | | | | |
|-----|---|--|-----|---|----------------------------------|
| 11. | { | Purple Mauritius, or Giant
Claret cane. | 15. | { | Sacuri.
Sacuri from Trinidad. |
| | { | Purple Mauritius from
Trinidad. | | | |
| 12. | | Keni-Keni. | 16. | | Bouronappa. |
| 13. | | Norman. | 17. | | Hillii. |
| 14. | | Naga. | 18. | | Mamuri. |
| | | | 19. | | Batramic. |
| | | | 20. | | Elephant.‡ |

* Obtained several years ago from Kew.

† So called from having been obtained from Demerara many years ago. It is characterised by the great tenacity with which it retains its trash.

‡ Appears to be the Tannoe, or Egg cane, mentioned by Leonard Wray in his "Practical Sugar Planter."

OBTAINED FROM THE BOTANICAL DEPARTMENT, DEMERARA.

- | | |
|------------------------|------------------------|
| 21. Lahaina. | 26. Chigaca. |
| 22. Honolulu. | 27. Meera. |
| 23. Rappee. | 28. White Mauritius. |
| 24. Keening. | 29. Striped Singapore. |
| 25. Queensland Creole. | |

OBTAINED FROM THE BOTANICAL DEPARTMENT, TRINIDAD.

- | | |
|----------------------|--------------------|
| 30. No. 1, Trinidad. | 35. Elephant Cane. |
| 31. No. 2, Trinidad. | 36. Nora Tava. |
| 32. Keri-Keri. | 37. Vihua Huala. |
| 33. Red Cane. | 38. Lahinia. |
| 34. Diard. | |

OBTAINED FROM ST. KITTS.

39. Caledonian Queen.

In addition to the gentlemen already mentioned in this Report, our thanks are due to the Barbados Railway Company for the loan of weighing apparatus, and to the various officers of Dodds Reformatory by whom our efforts have been willingly and ably seconded.

We have the honour to be, Sir,

Your most obedient Servants,

J. B. HARRISON,

Inland Professor of Chemistry and Agricultural Science.

JOHN R. BOVELL,

Supt. Botanical Station, Dodds Reformatory.

Before the discovery of the West Indies by the Spaniards in 1492; before the discovery of the East Indies by the Portuguese navigators in 1497; before the discovery of the Brazils, by the same nation, in 1500; abundance of sugar was made in the islands of Sicily, Crete, Rhodes, and Cyprus.

The sugar cane is supposed to be brought to these islands originally from India, by the Saracens; and from thence transplanted into some parts of Italy; and to Spain from Africa, by the Moors.—Dr. Moseley on Sugar (1799), page 15.

FURTHER EXPERIMENTS WITH "DIFFUSION" AT
NONPAREIL, DEMERARA, 1888-89.

We are indebted to the *Demerara Argosy* for this, the latest report of Mr. Quintin Hogg's "Diffusion" experiments on his *Nonpareil* plantation:—

After seventeen weeks of practically continuous work with the new system at *Nonpareil*, operations for the season have been or are being brought to a close, and the results, so far as at present ascertained, are represented as entirely satisfactory. Some allowance must, of course, be made for the effect of unforeseen and temporary obstacles in the manipulation of unfamiliar appliances; but the authorities of the estate do not appear to be of opinion that the loss therefrom has been very considerable. The average extraction per ton of canes sliced has been 84·6 per cent., which Mr. Garnett estimates as about 20 per cent. better than could have been obtained by double crushing in a first-class mill, and the extra return in sugar and molasses has been in almost exactly the same proportion. To this result the superiority of the Rillieux quintuple effet over the old triple has no doubt contributed in some degree, but the exact proportion we are not in a position to state. The total cost of the machinery, including erection, has been about £11,500 sterling; but it is calculated that in future it will be possible to furnish and erect plants of equal capacity for little if any more than half that cost—say £6,000 at the outside.

The process is almost entirely automatic, and requires but little tending. The feeding of the canes into the slicers has, necessarily, to be done by hand, but after that no further manipulation is required. One man to each of the eighteen hoppers suffices, and that number of feeders enables the machinery to dispose of thirty tons of canes per hour with the greatest facility. The actual process of slicing is invisible, taking place as it does in a concrete tank in the mill dock, on to the platform of which the canes are discharged from punts and thence fed through the hoppers into the machine. From a cavity into which the slices fall they are taken up by an endless wire rope, and conveyed to the "diffusion" battery, consisting of a dozen vertical boilers arranged around an elevated platform, into which the sliced canes are delivered by the carrier, which can be moved from one to another by a single attendant with very slight exertion. This "diffusion" battery is the central point of the system. It is here that the entire process of "diffusion" is accomplished. At a first

glance, with its multiplicity of pipes and valves and heat and pressure guages, it seems to the uninitiated an extremely complex and somewhat appalling arrangement, but is really exceedingly simple, the whole number of boilers requiring only one man to attend to them. And when the diluted saccharine, or juice of "diffusion" as it is called, has once passed through the series all trouble in regard to it is at an end, its subsequent treatment being exactly the same as that of ordinary juice. It will be remembered that when, in June, 1887,* the process was first tried in the colony, the machinery for slicing the canes could not be got to work satisfactorily, and Mr. Hogg was at that time apprehensive that the difficulty would prove insuperable. It has, however, been completely overcome, no difficulty whatever being now experienced. To change the knives once in two days is found to be amply sufficient, and the process involves a delay of only a very few minutes. Another difficulty was anticipated in the disposal of the chips, an accumulation of some four hundred tons a day during continuous working being a serious obstacle to face; but the discovery that, after being run through an ordinary cane mill, they would be available as fuel, and might be used immediately without any further drying process effectually disposed of it. The crushed chips are not so valuable for combustion purposes as ordinary megass, but the difference does not appear to be very great.

Mr. Garnett has obligingly furnished us with some figures, indicative of the results of the recent working of the process, which we hope will prove intelligible to our planter readers:—

		Per cent.
Percentage of Sugar in Canes.. . . .	13.041	= 100,000
Do. do. in Massecuite	11.749	= 90,092
Total loss	1.292	= 9,908
Do. do. on exhaust slices .. . . .	.823	= 6,318
Do. do. undefined .. . . .	.469	= 3,590
Percentage of Sugar in Molasses	1.666	= 12,775
Do. in Second Sugar	1.292	= 9,907
Do. in First Sugar.. . . .	8.791	= 67,410
		Tons.
Cane worked up.. . . .		26,144.929
Massecuite made		4,015.511
First sugar made		2,384.535
Do. do. polarization	96.4	
Second Sugar made		417.293
Do. do. polarization	81.0	

* See *Sugar Cane*, August, 1887, page 397.

Percentage of First Sugar on weight of Cane	9·120
Do. of Second Sugar do. do.	1·5
Do. of all Sugar	10·620
Average dilution	29·2
Coal per ton of 1st Sugar	22 cwt.

In relation to the value of the crushed chips as fuel, Mr. Garnett says that the chips contain on an average 55 per cent. of water; *i.e.*, assuming the canes to contain 12 per cent. of fibre, for every 100 tons of cane sliced, 25 tons of crushed chips should be available as fuel. But the fuel is of very poor quality. With good 70 per cent. double crushing, there should be in the megass, for every 100 tons of cane crushed, 12 tons of fibre, 3 tons of sugar, and 15 tons of water, whereas, after diffusion, and crushing in a mill, the crushed chips contain only 12 tons of fibre, 0·5 of sugar, and 13 tons of water. And he adds: "With mill crushing and burning the megass under suitable boilers, for every lb. of coal burnt under the boilers 14·5 lbs. of steam were generated. With crushed chips instead of the megass, only 10 lbs. of steam are generated, which shews that the chips are not by a long way as good fuel as megass. Had it not been for the Rillieux considerably more coal must have been burnt."

This is possibly not a perfectly complete scientific demonstration, but practical men will readily comprehend that the abstraction from every one hundred tons of cane by means of diffusion, of three tons more sugar than could be secured by simple crushing, must materially reduce the value of the chips as fuel.

The Portuguese first established sugar works in the Brazils in 1580. The Dutch, after the truce between Spain and Holland in 1562, began their expedition to Brazils, and in 1637 they sent Count Maurice thither. In 1641, when the treaty of peace was concluded between the Dutch and Portuguese, the former were in number 20,000, and had acquired seven of the fourteen captainships of Brazils. They had 60,000 negroes there, and made 25,000 chests of sugar. But in 1655 they were dispossessed of their territory, and ceded them by treaty in 1661 to the Portuguese; being reduced in number by wars and other disasters to only six or seven hundred persons. It was these Dutch fugitives, driven from the Brazils in 1655, that carried the art of planting the cane, and making sugar in a proper manner to the West Indian Islands.—Dr. Moseley on Sugar (1799), page 37.

SIR LYON PLAYFAIR AND THE SUGAR CONVENTION.

The following reply to Sir Lyon Playfair's, on the Sugar Convention, from Mr. Neill, the Honorary Secretary to the Greenock Sugar Refiners' Committee appeared in the *Glasgow Herald* of March 25th:—

Balgray, Greenock, March, 1889.

Sir,—Will you grant me space to make one or two remarks in reply to the letter from Sir Lyon Playfair on the Sugar Convention which appeared in your issue of 21st March?

Sir Lyon says that "the Convention, to my mind, is contrary to every principle of Free Trade." Now if this were correct it would be a reason why the Convention should not be ratified by Parliament. That the Convention is not only not "contrary to every principle of Free Trade," but is actually conceived in the very interest of Free Trade, will be apparent to anyone who will give the matter a few minutes' serious consideration. Free Trade may accurately be defined as the entire absence of any artificial advantage given by a Government to one producer over his competitor. The Government of this country since the Free Trade policy was adopted has aimed at equality of competition, and has set its face against any producer enjoying an artificial advantage over his competitor in trade. The British sugar producer and sugar refiner do not require, and have not asked, that any artificial advantage should be given them in order to carry on their business. They can produce and refine sugar better and cheaper than any other nation, and therefore would supply, at all events British markets, if not the whole world, were free trade in sugar adopted universally. The Continental producers and Continental Governments know that if they competed on equal terms—that is, on Free Trade terms—they would not be able to send a ton of refined sugar to this country. In order to compete at all they must have recourse to the unfair system of State subsidies. The Continental Governments, therefore, give their producers and refiners an artificial advantage in order that they may send their sugar to this country. In other words, the foreign Governments set at naught our Free Trade policy, and by stratagem grant Protection on British markets to their producers and refiners. As this granting of an artificial advantage or Protection on British markets to foreign producers is in direct violation of our fiscal policy, the Sugar Convention has been entered into, because it will be the means of foreign Governments withdrawing

the artificial advantage which they at present grant to their producers and refiners. The Convention does not give any artificial advantage to our home producers or refiners. Consequently when the Convention comes into operation neither the British nor the foreign producers will have any artificial advantage; they will both compete on equal terms, and thus absolute Free Trade in sugar on British markets will be restored, and the protection which the foreign producer at present enjoys will be abolished. That being the case, I maintain that Sir Lyon is incorrect when he says that "the Convention is contrary to every principle of Free Trade."

Sir Lyon says that the Convention "boycotts bounty-giving nations which decline to enter the Convention, as well as those which do." Sir Lyon might as well argue that if we know that a burglar has procured a false key by which he intends to enter our house at night and rob us of that which legally belongs to us, and we take effectual means to prevent him carrying out his nefarious designs, we are boycotting the burglar. The bounty is merely the false key by which the foreigner obtains an entrance into British markets, and thus is enabled to rob the British producer of that which naturally would be his were there no false keys—no bounties. The Government in entering into the Convention are merely acting the part of the police in depriving the foreign producer of his false key, and thus preventing him doing that which is contrary to the law of Great Britain. Whether the Convention boycotts the nations that persist in giving bounties or not, one thing is quite certain that it will not, as Sir Lyon seems to think, boycott the nations that become parties to it.

Sir Lyon says also that the Convention "will greatly disturb commercial intercourse between England and such important countries as France and the United States." I should like to ask the right hon. gentleman, the member for Leeds, if it is not a fact that Clause VII. of the Convention—the penal clause, as it is called—was actually proposed by the French delegates? I should like further to ask Sir Lyon if he is not aware that in 1881, when Lord Granville (then Secretary of State for Foreign Affairs) sounded the Continental Governments about the assembling of an International Conference for the purpose of having the bounties on sugar abolished, the reply of the French Government was that they would gladly send delegates to attend the proposed Conference on condition that a penal clause would be inserted into the Convention that might be agreed to at that Conference. Surely when the French were so anxious to have the penal

clause inserted into the Convention, they cannot now have any objection to the carrying out of the very clause they wished to be agreed to both in 1881 and 1888.

The right honourable gentleman further says that the Convention does a number of things "in order to protect a small industry of sugar-refining." I have already shown that the Convention will not grant protection to the British sugar producer or refiner, but will abolish the protection which the foreigner enjoys on British markets. Regarding the "small industry," I confess I am amazed that Sir Lyon should use such an argument. Is it only the large industries that are to have fair play on British markets? Because an industry is not of the dimensions of our cotton industry or our iron industry is it not to have justice? Surely Sir Lyon did not consider what he was writing when he penned the sentence the "small industry." Does Sir Lyon seriously argue that because a man is poor or is weak therefore he ought not to have justice done him, but should be allowed to perish? If that be the teaching of political economy, it was no wonder his great leader proposed to banish the dismal science to some far-distant planet.

The right hon. gentleman goes on to say, "If the price of sugar be increased by only one halfpenny in the pound, it will cost each working man's family from eight to ten shillings yearly more for their sugar." The whole point of the sentence I have just quoted lies in the "if." I might, with equal truth and more likelihood, say if the price of sugar were decreased one halfpenny per pound, the working man's family would save eight to ten shillings per annum. In the case of sugar, what does a halfpenny on the pound mean to the refiner? A halfpenny on the pound is four shillings and eightpence per cwt. If a refinery doing 1,000 tons a-week were to yield a profit of a halfpenny in the pound or four shillings and eightpence per cwt., the proprietors would make over £242,000 a-year, which on a capital of about £150,000 is about 160 per cent. Were such a profit to be made, there are thousands of capitalists who would invest their money in sugar refineries—even Sir Lyon himself might turn sugar refiner—and thus by competition and increase of production the price would arrive at its Free Trade level. If Sir Lyon only knew it, there is not a refiner in the kingdom that would not willingly accept a profit of sevenpence per cwt.—the eighth part of a halfpenny per pound—all the year through on his production. Now, look at the matter from the raw sugar producer's point of view. At

present the quantity of sugar produced every year in the world is about five million tons. The quantity we get from France is about eighty thousand tons per annum. Now, does Sir Lyon seriously argue that if France persists in giving a bounty on the export of sugar, and the penal clause in the Convention is enforced against the eighty thousand tons, that thereby the price of the remaining 4,920,000 tons of the world's production will be raised one halfpenny per pound, or about 30 per cent.? If Sir Lyon believes such a thing, I venture to say that there is not a single sugar planter who, in his wildest dreams about the effect of the abolition of the foreign sugar bounties, ever imagined such a profit. So long as the British sugar consumer has 4,920,000 tons of unbounty-fed sugar from which he can draw his supplies, there is not any chance of him having to pay anything above the natural price of the world's market, which is the price Cobden said Free Traders desired to buy their commodities at. The price of sugar is much more likely to be seriously enhanced if the natural sources of supply are dried up by the continuance of the bounties than if they are all freely opened, as they will be, by the abolition of the bounties.

I think I have touched on the main points of Sir Lyon's letter. Before closing, I should like to ask anyone who has taken the trouble to read this letter one or two questions. If the Sugar Convention is not ratified by Parliament, and it goes forth to the world that Great Britain approves of foreign nations giving bounties, who knows what industry will be attacked next? If America, for instance, out of her millions of surplus, chose to give a bounty on cotton yarn, or cotton cloth, or American iron, what would be the effect on British trade? What would be the effect on the profits of the employers or on the wages of the working classes in this country? A country whose policy it is to give a bounty on sugar may any day give a bounty on the article which the man who reads this letter earns his daily bread by producing. To prevent the spread of the unjust system, it is an absolute necessity that the British Parliament should speak out with no uncertain sound, and that the Sugar Convention should be ratified, and thus show foreign nations that while we are quite prepared to compete on equal terms, we are determined not to allow any foreigner to have an artificial advantage—in other words, be protected—on British markets.

I am, &c.,

TOM NEILL.

BRISTOL AND THE SUGAR BOUNTIES.

A NEW SUGAR REFINERY IN BRISTOL ON THE RATIFICATION OF
THE SUGAR CONVENTION.

On the 6th ultimo a conference of the representatives of labour was held in Bristol for the purpose of discussing the desirability of the ratification of the International Sugar Convention by the House of Commons. Mr. George Higgins (secretary of the Bristol Anti-Bounty Committee) presided, and there was a fair attendance, amongst those present being Mr. Samuel Peters (secretary to the London Committee of the Anti-Bounty League), Mr. R. G. Tovey (the labour representative in the Town Council), &c.

The CHAIRMAN regretted the absence of Mr. Hunt, the president of the Bristol Committee, who was prevented from being present by family affliction. He said they had every hope that in a very short time the question of the abolition of sugar bounties would come before the House of Commons, and that the ratification of the International Convention would be carried. There would then be an end of the agitation that had been going on for the last ten or eleven years. He believed that the first meeting ever held on the bounty question took place in Bristol, and it was probable that that would be the last meeting on the subject. If the convention were ratified by the British House of Commons, he had been assured that a new sugar house would be built in the city of Bristol, which would give employment to 400 or 500 workmen. They hoped within three or four months to see that work commenced. It would be a great boon to the workmen of Bristol if a new sugar refinery were started in the city, and it would well repay them for the trouble that had been taken.

Mr. J. Fox moved the following resolution:—"That this conference of representatives of trade and labour organisations of Bristol and district, being convinced of the injury to our home and colonial industry caused by the system of foreign export bounties, calls upon Her Majesty's Government to lay before Parliament the Bill for the ratification of the International Sugar Convention at their earliest possible convenience, so that employment may be found for thousands of unemployed workmen by the restarting of our closed refineries and the manufacture of machinery for our sugar-producing colonies." He said he thought the system of bounty-giving on exports was infamous. He trusted that the bounty question would not become a

party question, but if it did there would be a serious fight upon it. It was essentially a working-men's question, for if they had an industry filched from them they were to that extent the sufferers. The working classes had suffered enough during the last few years, and they were not in a position, neither were they willing, to suffer more of that kind of thing. A complete revolution had taken place in the opinion of the trades' unions of the country. He remembered when the trades' unions would not look at the proposal, but he was glad to say that within the last week two of the leading unions had passed resolutions approving of the abolition of the bounty system. He knew that thousands and thousands of tons of refined sugar were being brought into Bristol and bonded all over the city, and therefore the sooner the Government got the matter settled the better.

Mr. R. G. TOVEY seconded the resolution, remarking that if it were possible for the foreigner to ruin one industry, other industries would not be safe.

Mr. H. GREGORY (ex-sugar operative) supported the resolution. The closing of the Counterslip Sugar Refinery was a local calamity from which Bristol had not yet recovered. They claimed that the Government should give them their just and legitimate due—justice. They asked nothing more, but it behoved every working-man to watch the division when the question came before Parliament, so that they might distinguish who were their friends and who were their foes.

Mr. J. O'LEARY (member of the Trades' Council), supporting the resolution, said he was glad to see so representative a gathering determined not to cease their efforts until the last rotten prop which supported the bounty system was struck down.

Mr. S. PETERS also supported the resolution. He said the question would have to come before Parliament next week, at the latest, and he was convinced they should get a majority in favour of ratifying the convention. He was in a position to say that if this were done the Australian, South African, and West Indian merchants were prepared to give an order to engineers in London, Glasgow, Nottingham, Derby, and other places to the tune of over a quarter of a million's worth of machinery. And in Bristol, he might tell them that four of the principal men in the city were prepared, as soon as the treaty was ratified, to build a new refinery on the most approved principles, which would give employment to 300 or 400 men. They wanted security that British capital invested at home or abroad

in the sugar industry should not be attacked by foreign bounties. He thought they might depend upon the support of Sir Michael Hicks-Beach, Colonel Hill, and Mr. Lewis Fry, and he was astounded that a gentleman like Mr. Cossham should oppose the measure, as he did. tooth and nail. He had talked to Mr. Cossham, and tried to convert him, and why his reason was so prejudiced he could not say. He would not say an unkind word against Mr. Cossham, because he did not think a man was converted by abuse, but he did say that if Mr. Cossham studied the interests of his constituents—for he remembered when at least 1000 of his constituents gained their living through Finzel's firm—he would be one of the first men to support the measure. He denied that they wanted to raise the price of sugar, and in reply to the contention that the proposal was contrary to the principles of free trade, he said that if it were an act of justice he did not care what principles it affected.

On the motion of Mr. PEPLER, seconded by Mr. J. POPE, it was agreed—"That the foregoing resolution be signed by the Chairman and forwarded to the Prime Minister, the Right Hon. W. H. Smith, the Chancellor of the Exchequer, the Right Hon. Baron de Worms, the Right Hon. W. E. Gladstone, and the four members for the city of Bristol."

The meeting concluded with thanks to the chairman.

ANGLO-CONTINENTAL (LATE OHLENDORFF'S) GUANO WORKS.

LONDON AGENCY: 15, LEADENHALL STREET, E.C.

Wherever intelligent sugar cane cultivation is carried on, Ohlendorff's Cane Manures is a household word.

We have just received from this firm a pamphlet in which is given reports of experiments, some of which have already appeared in *The Sugar Cane*. At the end of the pamphlet is printed an interesting account of their works on the Thames, from the pen of the late Mr. John Chalmers Morton, an eminent agricultural writer, and forms one of a series of articles by him on "Our Great Supply Establishments":—

The Anglo-Continental (late Ohlendorff's) Guano Works—for such is now its proper and most appropriate designation—has now become the sole guano importer, I am given to understand, recog-

nised by the Chilian Government. The whole of the guano imported from the western coast of South America comes through this firm, and is landed as they direct, at their warehouses on the Thames, at Southampton, Plymouth, Dublin, Bristol, Liverpool, Leith, Hull, and other outports, thus supplying the demand at various points of the coast. It is to the establishment on the Thames, close to the Victoria Docks, that I have to confine myself at present.

The Company have here about eight acres, in a long rectangle, abutting with wharfage on the Thames; and there has here grown up during the past fifteen years the most compactly arranged and perfectly organised establishment for at once the storage and the manufacture of fertilisers that I have yet seen. A very liberal establishment for offices and laboratory,—sulphuric acid works (furnaces, chambers, towers)—some 400 h.p., in three or four steam engines, placed where they are wanted for driving fans, crushers, elevators, mills, mixers, and disintegrators—lofty buildings for the storage of manure, both imported and manufactured—for the storage also of raw material as well as finished foods—large, cleared, open spaces giving a wealthy and prosperous air to the whole establishment:—these are the main features of the place. And the whole is under a veteran commander-in-chief, who has got the rank and file of his large forces in admirable discipline—himself apparently uniting the office of field-marshal with that of paterfamilias.

Wages are paid weekly and individually. The gang-system, in its injurious character, is unknown. The people work in companies instead of gangs—one set may be engaged in attending on a mixer; another, on a grinding mill; another in shifting goods; yet another perhaps, in packing up for despatch; others on the wharf loading and unloading vessels and barges; and there is a price per ton agreed upon—hanging, indeed, printed, framed, and glazed upon the office wall—putting down the rate for everything from 1½d. a ton for tying and sewing sacks, and upwards; but the wage earned by each company or gang is divided and paid individually; every person receiving exactly his proper share—none of that risk being run of grinding down the earnings of the labourers which is incurred when a ganger is alone responsible, and gets the work done as cheaply as he can.

By far the most striking feature of the whole establishment here is the enormous masses of guano sacked up and piled in heaps under the lofty shading—lying, not in bulk, but carefully built up, often 40

feet high, layer on layer of the bags in which it has been sacked—separate shiploads—800 to 1,200 ton lots. These separate masses of mason work, as it were, look as if they might be the plinths at the foundation of a tower whose top should reach to heaven. The bulk in which it is imported is crushed and screened for the removal of any stones which may be present, and then bagged up in $1\frac{1}{2}$ cwt. lots ready for sale or for further treatment. The Chinca Islands have long been exhausted, but from the Lobos Islands on the northern coast of Peru, and Pabellon de Fica, Hunta de Lobos, and Huanillos further south, guano is still imported at the rate of about a hundred thousand tons annually. Besides the close examination and preparation of the kind just named, which every cargo gets, each being properly sampled and sold by analysis according to its ammonia, which may vary from 8 to 11 per cent., and its phosphates from 30 to 45 per cent., and its potash from 2 to 4 per cent.—besides this sampling and preparation for sale pretty much as it arrives, large quantities of this guano are subjected to the action of sulphuric acid for the fixation of its ammonia and the solution of its phosphate of lime. So many measured barrow loads are emptied into a circular trough on the floor, and the measured dose of sulphuric acid, determined by the analysis, is poured in amongst it, the whole being mingled by a revolving rake, and thereafter wheeled out and spread some 2 feet deep upon the floor, where it soon hardens, requiring thereafter to be passed through a disintegrator before being sacked for sale.

The raw materials used here in addition to the imported guano, include all the various phosphates and the several sources of ammonia, &c., which are the staple of all our manures—coprolites from the home counties; phosphates from Caralina, and elsewhere; bones, bone meal, and potash salts, dried blood, &c.,—are all stored under shelter near the mills and mixers through which they pass.

Leaving the offices near the entrance gate, and crossing the open—perhaps an acre or more yet unoccupied—we come on the first range of roofing, under which stone-breakers, Morris' mills, and other crushers, both for bone and phosphates are at work—driven by steam power close at hand, and fed with the raw material stored beside them. The various "meals"—flour of phosphates, &c.,—coming from the mills are drawn off by exhausts, or lifted on to sieves, and so ensured of a proper fineness—are carried in bags to mixers, of which there are two in constant operation, capable of turning out over 100

tons a day ; and here a "gang" are in attendance, with a foreman directing the charge—so many bags of every kind—mineral phosphate, bone-dust, sulphate of ammonia, potash, what not—according to the proper formula of the manure which may at the time be manufacturing. It may, indeed, be only so many bags of the phosphate powder with the dose of sulphuric acid needed, according to the ascertained composition of the phosphate, to make a superphosphate. These being thrown into the mixer, receive so many minutes of revolution, while another charge is being got ready ; and the whole is then "let go"—falling on the mass below, which soon hardens and is ready for the disintegrator, which prepares it for the bags in which it is despatched for sale. The poisonous and injurious steam of acid vapour in which the whole of this operation used to be developed is now drawn off by fans, and passed through successive chambers in a condensing apparatus where, by injected steam and trickling water, it is all gathered up—sulphuric acid and hydrofluoric acid, &c.,—passing finally in a small constantly-flowing stream to waste in the sewer.

Passing through the preparing shed we come upon the storage, in which the manufactured manure lies under a not very lofty roof. This storage is cleared out many times a year, but is capable of holding many thousand tons. Beyond it lies the lofty guano store already referred to—iron girder columns, 25 feet in height, carrying a roof of iron and glass. And beyond this, again, is the wharf, where raw material is arriving from both Continents, and manufactured manures are despatched to many home and foreign ports. Here, too, is an office and a telephone, and placing myself in communication with the offices of the Company, at 15, Leadenhall Street (six or seven miles away), I hold a conversation with the City office, expressing the pleasure which my two hours' inspection, under the guidance of the manager, had given me.

THE SULPHURIC ACID MANUFACTURE.

Not only are guanos, phosphates, nitrates received at the wharf, but sulphuric acid also. Large quantities have to be purchased annually. Half this department of the works here had been cut off by a fire which had destroyed many of the acid chambers (since rebuilt and enlarged by an additional set of acid chambers). The acid is pumped from tanks in the barge to tanks on shore, and thence flows to the several points in the factory where it is required. Returning towards the entrance one observes the ready access to all

parts by rails laid alongside, connecting either the raw material shed with the wharf, or the storage sheds with the various inland railways. We look in also at the shop, where necessary repairs, whether in engines or machines, can be effected. Bags are branded by a steam printing press. And again across the open, and near to the entrance I am taken over the sulphuric acid works, which are of the usual kind. The Spanish pyrites is fed as a powder into the furnace, where it is its own fuel, passing over successive floors or trays within the furnace, and coming out effete at foot. The fumes of the sulphurous acid thus driven off are oxydised by the nitrous acid from pots of nitric and sulphuric acid as they enter, along with injected steam, the leaden chambers; and these are supplemented by the usual Glover and Gay Lussac towers for the recovery of whatever fumes would otherwise be wasted. And a most elaborate record is kept of the behaviour of every effluent. The composition and the strength, whether of air or liquid (sampled elsewhere), is known and recorded at frequent intervals. And no official inspector sees anywhere, I'll warrant, a more thorough or a completer history day by day and hour by hour, of what is, of course, in itself a dangerous manufacture.

These records are also a security to the Company against any avoidable waste. And, indeed, economy of every possible kind is practised throughout. One of the latest instances of this is seen in the recovery of a very considerable quantity of sulphate of ammonia, obtained by steaming or boiling the bags in which that material is purchased, thus extracting the utmost of their contents before turning them to other uses.

One of the most interesting features of the whole institution here is the satisfactory character of the relations which subsist between employers and employed. It has not been without most satisfactory fruit of this kind that Mr. Crowder has been in charge down here from the start. Nor is the weekly, yearly course of never-ceasing industry without the enlivenment of occasional enjoyment shared by himself with those under his command—culminating, indeed, in a summer holiday shared in common, when the whole force—the “general” and all the companies he commands—including not only wage-earners, but all their families (and there are some households numbering a dozen among them) enjoy a summer's day together, a special train taking them to the shore and bringing them back to their homes and work next day, heartened, invigorated, stengthened, with all the

better will for the future, all the greater loyalty to one another, and to the great firm of which they feel themselves to be a part.

I may add as a postscript to this story, that the Company manufacture and sell annually over 100,000 tons of guano and manures, a large quantity being shipped from the London factory to the Colonies for sugar, coffee, and tobacco plantations.

Three hundred to four hundred labourers, all British hands, are constantly employed in the London factory, and a healthy and strong lot they are, carrying on their shoulders bags weighing 2 cwt. and more, or wheeling heavy barrows containing 200 lb. to 300 lb. of material. Vessels of 600 to 800 tons burden are loaded in one day, the men running like cats on swinging planks from the stores over the wharf on board the ships. Three large vessels can load at a time, and a number of barges for river traffic.

MR. GOSCHEN ON THE SUGAR CONVENTION.

Mr. Goschen, in the speech made by him at Stratford, on the 30th January, made the following important statement of his views and intentions with regard to the Sugar Convention :—

“Then we shall have other matters to deal with. It is possible that some time may have to be devoted to defending a step which has been taken by Her Majesty's Government, and which I will mention because I believe many of you are deeply interested in it. It is possible we shall have to defend the Convention which we made with foreign countries for the extinction of the system of bounty-fed sugar. (Cheers.) It will be our duty to prove, in carrying out that measure, that we have not sinned against any of the laws which regulate trade; AND I, FOR MY PART, SHALL FEEL IT MY DUTY TO PROVE THAT IT DOES NOT OFFEND, AS OTHER STRONG AND STOUT FREE-TRADERS HAVE THEMSELVES CONTENTED, AGAINST THE DOCTRINE OF FREE TRADE.”

In spite of the emphatic statement of one of the highest authorities, that “a duty to countervail a bounty is not only consistent with free trade, but positively conceived in the interests of free trade,” the opponents of the Convention have not hesitated to brand it as a protectionist measure. Though their arguments, or rather assertions, have been constantly controverted, they do not hesitate to repeat them, hoping that they may make an impression on some thoughtless minds.

All further trouble in the matter will be removed when Mr. Goschen makes his promised speech. Even his statement, here quoted, is sufficient reply to those who use the word “protection” with so much recklessness and so little sense.

MONTHLY LIST OF PATENTS.*

Communicated by Mr. W. P. THOMPSON, C.E., F.C.S., M.I.M.E.,
Patent Agent, 6, Lord Street, Liverpool; 6, Bank Street,
Manchester; and 323, High Holborn, London.

ENGLISH.
APPLICATIONS.

3306. S. P. THOMPSON, London. *Improvements in polarimeters and saccharimeters.* 25th February, 1889.

3526. A. G. SALAMON, London. *Improvements in the preparation of cane and beet sugar.* 27th February, 1889.

4121. F. DEMMIN, London. *Improved method of cleansing or whitening sugar in the centrifugal machine, and apparatus therefor.* 8th March, 1889.

ABRIDGEMENTS.

3014. OTTO BRAUN, Berlin, Germany, Civil Engineer. *Improvements in centrifugal machines.* February 28th, 1888. According to this specification, the cage of the machine is attached to the upper part of a vertical shaft, by a universal joint, in such a manner that the centre of gravity of the empty cage is below the point of suspension. The shaft is divided into two parts, an upper and a lower portion, which are connected by an elastic friction joint. The upper portion is guided by an elastic bearing, and is connected to the universal joint above mentioned by a second friction joint, which prevents strain when starting or changing speed, &c. The lower portion of the shaft receives its rotary motion by means of a pulley of small diameter, provided with several grooves, around which the driving cord is wound, whence the said cord passes to a larger driving pulley. An intermediate tension and guide pulley is provided. Speed gauges, consisting of graduated closed glass tubes, containing some transparent liquid are mounted upon the axles of both the receiving and transmitting pullies. The loss of power, if any, during transmission can thus be ascertained.

Patentees of Inventions connected with the production, manufacture, and refining of sugar will find *The Sugar Cane* the best medium for their advertisements.

The Sugar Cane has a wide circulation among planters in all sugar producing countries, as well as among refiners, merchants, commission agents, and brokers, interested in the trade. at home and abroad.

* The remainder of the April Patent List will appear in May number.

IMPORTS AND EXPORTS (UNITED KINGDOM) OF RAW AND REFINED SUGARS.

JANUARY 1ST TO FEBRUARY 28TH, 1888-1889.

Board of Trade Returns.

IMPORTS.

RAW SUGARS.	QUANTITIES.		VALUE.	
	1888.	1889.	1888.	1889.
	Cwts.	Cwts.	£	£
Germany	475,629	1,144,098	361,714	783,517
Holland	38,807	24,260	27,817	15,579
Belgium	140,361	241,984	98,246	146,033
France	1,006	22,345	1,001	14,706
British West Indies & Guiana	271,322	401,281	251,594	345,948
British East Indies	121,069	52,201	61,470	24,721
China and Hong Kong ....	...	...	...	...
Mauritius	39,354	5,698	26,884	4,261
Spanish West India Islands	60,833	...	47,436	...
Brazil	661,785	116,654	426,214	76,866
Java	799,570	123,848	651,449	99,730
Philippine Islands	61,900	55,405	30,795	27,220
Peru	154,190	142,309	119,277	104,447
Other Countries	108,980	129,290	81,482	84,677
Total of Raw Sugars ..	2,934,806	2,459,373	2,175,379	1,727,711
Molasses	20,552	24,139	7,957	8,677
Total Sugar and Molasses .....	....	....	2,183,336	1,736,388
REFINED SUGARS.				
Germany	434,434	770,583	385,324	672,413
Holland	207,862	228,950	195,116	209,957
Belgium	41,245	42,388	39,472	40,004
France	146,490	238,825	137,717	211,150
United States	3,734	5,388	3,353	4,393
Other Countries	8,834*	215,164*	7,150*	176,063
Total of Refined	842,599	1,501,298	768,132	1,313,980

EXPORTS.—REFINED SUGARS.

	Cwts.	Cwts.	£	£
Sweden and Norway	10,882	12,012	9,599	8,844
Denmark	9,046	17,314	6,788	12,689
Holland	11,427	13,990	8,822	9,949
Belgium	6,036	4,429	4,689	2,902
France	625	3,195	487	2,225
Portugal, Azores, & Madeira	16,025	10,621	12,165	7,434
Italy	6,216	15,056	4,858	11,368
Other Countries	26,516	25,380	22,461	19,874
Total of Exports	86,773	101,997	69,869	75,285

* Entirely from Russia.

SUGAR STATISTICS—GREAT BRITAIN.

TO MARCH 23RD, 1889 AND 1888. IN THOUSANDS OF TONS, TO THE NEAREST THOUSAND.

	STOCKS.		DELIVERIES.		IMPORTS.	
	1889.	1888.	1889.	1888.	1889.	1888.
London	32	58	65	57	66	61
Liverpool ..	83	119	71	62	59	97
Bristol	4	5	15	10	17	11
Clyde	33	40	54	48	63	45
Total ..	152	222	205	177	205	214
	Decrease.. 70		Increase.. 28		Decrease.. 9	

SUGAR STATISTICS—UNITED STATES.

(From Willett and Hamlin's Circular.)

FOR THE FOUR PRINCIPAL PORTS. IN THOUSANDS OF TONS, TO THE NEAREST THOUSAND. FOR FEBRUARY, 1889 AND 1888.

	STOCKS.		DELIVERIES.		IMPORTS.	
	March 1st.		In February.		In February.	
	1889.	1888.	1889.	1888.	1889.	1888.
New York	34	64	32	37	32	47
Boston	2	8	11	11	10	16
Philadelphia....	—	1	17	23	17	24
Baltimore .....	..	..	..	..	..	..
Total.....	36	73	60	71	59	87
	Decrease.. 37		Decrease.. 11		Decrease.. 28	
Total for the year			133	139	137	164

NEW YORK PRICES FOR SUGAR.

From Willett, Hamlen & Co.'s Report, March 14th, 1889.

FAIR REFINING.	96o/o CENTS.	GRAN- ULATED.	STAND. A.	STOCK IN FOUR PORTS.
Mar. 14, 1889.—5½c.	5½c.	7c.	6½c.	Jan. 1, 1889— 32,254 tons.
Mar. 15, 1888.—4¾c.	5 7-16c.	6¾c.	6½c.	Jan. 1, 1888— 47,798 tons.
Mar. 17, 1887.—4 9-16c.	5 ½c.	5 11-16½c.	5 5-16-¾c.	Jan. 1, 1887—102,279 tons.
Mar. 18, 1886.—4 15-16c.	5 9-16c.	6½c.	6 13-16c.	Jan. 1, 1886— 57,328 tons.
Mar. 19, 1885.—4 11-16c.	5 5-16c.	6 1-16c.	5½c.	Jan. 1, 1885— 89,186 tons.
Mar. 13, 1884.—5 11-16c.	6 9-16c.	7½c.	7c.	Jan. 1, 1884— 60,900 tons.
Mar. 15, 1883.—7¼c.	7 13-16c.	8 15-16c.	8½c.	Jan. 1, 1883— 50,297 tons.
Mar. 16, 1882.—7¼c.	7 15-16c.	9 3-16c.	8½c.	Jan. 1, 1882— 43,927 tons.
Mar. 17, 1881.—7 5-16c.	8 1-16c.	9½c.	8½-¾c.	Jan. 1, 1881— 66,999 tons.
Mar. 11, 1880.—7¼c.	8½c.	9½c.	9½-¾c.	Jan. 1, 1880— 63,538 tons.

STOCKS OF SUGAR IN THE CHIEF MARKETS OF EUROPE ON THE
28TH FEBRUARY, FOR THREE YEARS, IN THOUSANDS
OF TONS, TO THE NEAREST THOUSAND.

Great Britain.	France.	Holland	German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1889.	TOTAL 1888.	TOTAL 1887.
154	215*	34	265*	155*	25	848	919	1066

*Estimate.

CONSUMPTION OF SUGAR IN EUROPE FOR THREE YEARS, ENDING
28TH FEBRUARY, IN THOUSANDS OF TONS, TO THE
NEAREST THOUSAND.

Great Britain.	France.	Holland	German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1889.	TOTAL 1888.	TOTAL 1887.
1274	450	35	461	223	348	2791	2660	2601

*Estimate.

ESTIMATED CROP OF BEET ROOT SUGAR ON THE CONTINENT OF EUROPE
FOR THE PRESENT CAMPAIGN, COMPARED WITH THE ACTUAL CROP,
OF THE THREE PREVIOUS CAMPAIGNS.

(From Licht's Monthly Circular.)

	1888-89.	1887-88.	1886-87.	1885-86.
	Tons.	Tons.	Tons.	Tons.
France.....	470,000 ..	392,824 ..	485,739 ..	298,407
German Empire ..	980,000 ..	959,166 ..	1,012,968 ..	838,131
Austro-Hungary..	525,000 ..	428,616 ..	523,059 ..	377,032
Russia and Poland.	510,000 ..	441,342 ..	487,460 ..	537,820
Belgium	140,000 ..	140,742 ..	135,755 ..	93,690
Holland	45,000 ..	39,280 ..	36,098 ..	28,818
Other Countries..	55,000 ..	49,980 ..	49,127 ..	46,075
Total....	2,725,000	2,451,950	2,730,206	2,219,973

As compared with last month, Mr. Licht reduces his estimate for France by 5000 tons, and increases that of Germany by like amount. His estimate for Austria is reduced by 25,000 tons.

Mr. Görz's estimate for the present crop (1888-89) is 2,560,000 tons, or 165,000 tons less than Mr. Licht's.

STATE AND PROSPECTS OF THE ENGLISH SUGAR MARKET.

There has been a good market during the past month, and a large business done. Values have advanced from 1s. per cwt. to 3s. per cwt. The greatest change has been in the price of beet 88%, which a month ago was 14s. 3d. per cwt., and is now 17s. 3d. per cwt., which is the highest point reached since February, 1884.

Everything points to present values being maintained, and it may be that, in the near future, we may see a still further improvement. The deficiency in the Cuban crop is variously estimated; but the lowest figure is 50,000 tons less than 1887-8. The Java crop also is expected to fall short by about 50,000 tons, the Brazils by 100,000 tons, and Demerara by 25,000 tons. On the other hand the supply from the Philippines may be 60,000 tons in excess of previous years.

The domestic supply of the United States will be, in all probability, much the same as last year. What Louisiana is short of, the Hawaiian Islands make up.

There is therefore much in the present situation to justify holders of sugar in standing out for full prices.

The imports of foreign refined in February were 32,010 tons against 16,014 tons for the same month in 1888.

The deliveries into the United Kingdom (four principal ports) up to March 23rd were 205,167 tons against 176,818 tons for same period in 1882, and the imports 205,186 tons against 213,441 tons.

The stocks in the United Kingdom (four principal ports) on March 23rd were 151,721, or 70,247 tons less than a year ago.

Present quotations for the standard qualities, as under, are:—


FLOATING.		Last Month.
Porto Rico, fair to good Refining	14/6 to 15/-	against 13/- to 14/3.
Cuba Centrifugals, 97% polarization	17/-	„ 16/-
Cuba, fair to good Refining	14/6 to 15/-	„ 13/3 to 13/9.
Java, No. 14 to 15 D.S... ..	18/6	„ 16/3 to 16/9.
British West India, fair brown.. ..	14/6 to 15/-	„ 13/6 to 14/-.
Bahia, low to middling brown	11/- to 12/-	„ 10/- to 12/-.
„ Nos. 8 to 9	13/- to 13/6	„ 12/- to 12/6.
Pernams, regular to superior Americans..	12/- to 15/-	„ 11/- to 13/-.
LANDED.		Last Month.
Madras Cane Jaggery.. ..	11/6	against 10/9 to 11/-.
Manila Cebu and Ilo Ilo	10/6 to 11/6	„ 10/- to 11/-.
Paris Loaves, f.o.b.	20/-	against 17/6 to 18/-.
Titlers	22/-	„ 19/6
Tate's Cubes.. ..	23/-	„ 21/-
Russian Crystal, c.i.f... ..	18/-	„ 16/9
Beetroot, German, 88%, c.o.b.. ..	17/3	„ 14/3

THE SUGAR CANE.

No. 238.

MAY 1, 1889.

VOL. XXI.

 The writers alone are responsible for their statements.

N.B.—All communications to be addressed, and Cheques and P.O. Orders made payable to HENRY THORP, Ducie Chambers, 57, Market Street, Manchester.

For Scale of Charges for Advertisements, see page xi.

For Table of Contents, see page iii.

Lord Bramwell is amongst the opponents of the Sugar Convention, and has been ventilating his views in the *Times*. The following reply from Mr. N. Lubbock, addressed to the same paper, sufficiently indicates the nature of Lord Bramwell's letter:—

Sir,—I quite agree with Lord Bramwell that, whether the value of the sugar we consume is £30,000,000, as he contended, or £18,000,000, as the Board of Trade returns show, the industry is too large to be tampered with. It has, indeed, been tampered with far too long, and now that foreign Governments have agreed that this interference shall cease provided, among other things, that our Government joins in the agreement, we ought as freetraders to rejoice.

Lord Bramwell's epigram, "Bounties are bad things for those who give them, and therefore should be abolished by those who receive them," is hardly to the point. Any one who expects the foreign recipients of the bounties to assist in their abolition must indeed be very simple. But foreign Governments are willing to abolish them, and we, whose consumers are now suffering so seriously by them, we, whose industries are so seriously crippled by the uncertainty produced by them, ought most naturally to welcome and assist in such a change in their policy.

Bounties are bad for those who give them, worse for those whose industry is injured by them, worst of all for the consumers who depend upon them.

I am, Sir, your obedient servant,

Westward Ho, April 18.

N. LUBBOCK.

We notice that Sir T. H. Farrer addresses his letters on the Sugar Convention to the *Daily News*, and not to the *Times*, or if addressed to the *Times* they do not appear in it.

Mr. James Duncan's large refinery on the Thames, known as the Clyde Wharf Sugar Refinery, which is said to have cost upwards of £300,000, and which was offered for sale by auction in March, 1887, without result, the upset price being £92,000, has been purchased by Messrs. David Martineau and Sons, for a figure very much below this. It is one of the largest refineries in Great Britain, having a capacity of turn out of 1,800 tons weekly.

In addition to the five new sugar factories, the erection of which in Hungary we have already announced as decided on, negotiations for the establishment of several others are in progress, one of which will be at Szolnok, another somewhere on the line between Pesth and Fünfkirchen.

The Gustrow factory, near Lübeck, announces a dividend of 10 per cent. The Dernbach factory, near Eisenach, is to be removed and set up at Rudesdt, with larger plant and new machinery from the Sägerhausen Co. The Rheinische Aktienverein, of Cologne, has decided to erect a refinery at Alten, near Dessau.

For some weeks the *Prager Zuckermarkt* has been publishing a continuous article on the probable deficiency in the supply of sugar for some months to come. This article has excited much attention, and has been followed by an article in the *Journal des Fabricants de Sucre* on the "Statistical situation of the Sugar Market."

The Prague journal considers that the general visible stock on the 1st October, 1889, will not exceed at the most 230,000 tons, and may fall as low as 200,000 tons. Mr. Goerz and others arrive at pretty nearly the same results, indeed, the former puts the figure as low as 175,000 tons. The general visible stock on 1st October, 1888, was 471,800 tons. M. Dureau regards this as a serious question for England.

This year the proportions of sugar entering the United States from Europe and the Colonies have already been reversed, Europe having in 1888-89 contributed one-third of the entire imports into the United States, against $\frac{2}{3}$ in the previous year, and in face of the expected deficit in the crops in Cuba and Brazil, the United States will have to look to Europe to supply an even greater proportion this year. M. Dureau thinks that we shall have a "struggle for sugar" between the two great sugar-consuming countries. He sums up as follows:—

“The interesting point will be to know the amount of the consumption of 1888-89. It appears probable that it will be in excess of that of 1887-88, at any rate, the experience of former years leads us to presume so. But what will be the increase? We do not know. The *Prager Zuckermarkt* lately admitted that the figure would reach 5,300,000 tons. Under these circumstances, the production of cane sugar (for export) being reduced to 2,307,000 tons in consequence of the Cuban deficit, and the production of beet sugar being 2,622,000 tons, the total supply for 1888-89 would be 5,420,000 tons, and deducting the amount taken for consumption, there would only remain 120,000 tons for the general visible stock on the 1st October next. This figure may be doubled, if you like; none the less, the situation would be excellent, and, in any case, the production of 1889-90 will have to increase to a very notable extent for this situation to be modified in an unfavourable sense. Undoubtedly there are requirements which will have to be met by the producers, but the manufacturers will do wisely not to over-increase their production; the statistical position of the article has become excellent, and its maintenance is henceforth dependent simply on the prudence and the moderation of the producers.”

On March 5, 1887, an Act “to encourage the manufacture of sugar” was passed by the Kansas Legislature, granting a bounty of 2 cents. per pound (9s. 4d. per cwt.) on all sugar manufactured in the State, and containing not less than 90 per cent. of crystallised sugar. The amount claimed as bounty up to January of this year is \$13,965·56, representing a production of sugar of 698,278 pounds, or, say, 311½ tons.

Parkinson Sugar Company	\$7,139·44
Topeka Sugar Company	4,144·58
Conway Springs Sugar Company	1,910·58
Douglass Sugar Company	770·96

\$13,965·56

The report of the State Board of Agriculture of Kansas, issued February, 1889, from which the above figures are taken, concludes its remarks upon the sugar industry in Kansas as follows:—

The cost of a complete sugar factory with the best modern machinery, all erected and ready for operation and fully warranted, will be about \$75,000

for a 200-ton plant, and about two-thirds of this amount for a 100-ton plant. A plant arranged for the manufacture of syrup only, but properly equipped to employ the processes by the use of which the sugar is retained in crystallizable form, will cost about three-fourths as much as a complete sugar plant of like capacity.

Some of the large machinery companies are now offering to furnish the machinery complete, and warrant it.

There is a limited supply of sugar-makers, which can probably be reinforced from Louisiana and from Germany. The sorghum-sugar processes so resemble those used in other sugar factories that sugar-makers, whose experience has been confined to beet sugar or to tropical cane sugar, readily learn to so modify their methods as to become successful sorghum-sugar makers. But it is important, on account of the assured rapid development of the Kansas sugar industry, that well-educated and efficient sugar-makers be trained for the work.

The Kansas Legislature has also just enacted a law authorizing counties, townships and cities to vote bonds, not in excess of \$20,000, for the purpose of aiding and encouraging sugar factories. This law, says *The American Economist*, seems to have been immediately productive, for on the 20th inst. charters were filed with the Secretary of State for three companies with an aggregate capital of \$725,000, and the Governor estimates that 50 factories will be established under the law before the close of the season. If the Governor's anticipations are realized, and the 50 factories are as productive as the Fort Scott works, Kansas will soon be making 25,000 pounds of sugar, and the attack on our sugar industries, unless carried in the Fifty-first Congress, may be laid aside with other futile Free-Trade efforts.

UNION OF GERMAN SUGAR MANUFACTURERS FOR OBTAINING STATISTICAL INFORMATION.—The systematic way in which our German friends go to work, which often leads to deserved success, is well illustrated by a report which we have just received.

It will have been noticed by readers of our journal (see April, 1888, *Sugar Cane*, page 203,) that there has been some dissatisfaction expressed, both in France and Germany, with the statistics furnished by Mr. Licht, who, however, seems still to be accepted as the real prophet in English commercial circles. In addition to the official statistics of the German government, Mr. Licht has his own special means of obtaining information, but the fact that for some years his estimates have always eventually proved to be in excess of the actual figures, led to

an attempt to obtain, by combined action of the manufacturers, trustworthy figures with regard to the area sown, the state of the crop at certain periods, the probable production, the stocks on hand at given dates, &c., which would furnish data for reliable calculations. The Association founded for this purpose last year, with Mr. Jos. Goerz, of Berlin, as general business manager, has just issued its first annual report, which states that the results obtained during the past year have been satisfactory beyond the expectations originally formed, and as the periodical reports appear earlier than the official figures, and are at once communicated to the members of the Association, they are well adapted to form a sound basis for estimating the probable production of the current campaign, and so counteracting the manoeuvres of interested speculators. The cost has been somewhat less than originally anticipated, and there appears to be some hope of eventually obtaining the co-operation of other beet-growing countries, and so giving the Association an international character.

We learn that the Standing Committee of the French Sugar Manufacturers' Association have just made an arrangement for a somewhat similar mutual supply of statistical information.

The *Havana Weekly Report*, in its issue of April 6, contains its annual review of the Cuban sugar crop. It says:—"We are glad to be able to give this year an account of a campaign more favourable in its results than any of the three or four preceding ones. To the advance in prices, which was fairly sustained from the commencement of the year, with slight alterations only, we may add further reductions introduced in the cost of production on a large number of plantations, owing to a more careful cultivation of the cane and the establishment of improved apparatus, allowing the extraction of a larger quantity of sugar at a comparatively smaller cost. To planters the operations of the last campaign were by all means somewhat more satisfactory than for several years previous, not only because of the higher plane of values upon which the world's supply of raw sugar was marketed, but also because of the evidence afforded of increased consumption and the healthier relations that are likely to subsist between supply and demand for the next few years. The Cuban crop last year showed a small increase over that of the previous year, but did not yield as much as had been estimated at the beginning of the crop. The setting up of new and more modern machinery

throughout the island is constantly reducing the production of muscovadoes and increasing that of centrifugals. This change in the relative preponderance of these grades has been steadily progressing for several years, and it is now predicted that probably within a few years more the entire crop will be turned into centrifugals. Planters who are unable to purchase new machinery will send their cane to some neighbouring central factory. Planters, especially those on the southern coast, displayed much activity, and whilst several new estates were started between Cienfuegos and Guantanamo, the productive power of a large number of those already existing was considerably improved and increased; most of those which heretofore manufactured muscovadoes either ceased to grind and sold their cane to the nearest central, or set up centrifugal and treble effect apparatus, in order to produce sugars of better classes. The prospects of a large crop for 1889 were diminished by the terrific cyclone of 9th September, by which over one hundred plantations were demolished. Owing to the rainy weather that prevailed after the hurricane and the cold that hastened the ripeness of the cane, it was necessary to inaugurate grinding earlier than customary, and at the commencement of December there were already several estates grinding, though operations were delayed on the greater part on account of repairs to be made to machinery and buildings, the setting of new apparatus, and the increased scarceness of workmen. In accordance with statements compiled from the most reliable sources and carefully rectified, the total production was as follows:—

1887-88 SUGAR CROP.	Tons.
Total exports in 1888	613,719
Consumption in 1888	50,000
Stocks on December 31, 1888	8,500
Total	672,219
Less stocks on 1st January, 1888—	
At Havana and Matanzas	10,161
At other Ports	5,389
	<hr/> 15,500
Total production, 1888	656,719

An increase of 10,141 tons, equivalent to $1\frac{1}{2}$ per cent. over the crop of 1886-87, which aggregated 646,578 tons.

THE SUGAR CONVENTION.

On the 11th ult., Baron H. de Worms brought forward the Government Bill for the ratification of the Sugar Convention, the text of which, together with his speech in introducing it, and the short discussion which followed, we give at page 235. It passed the first reading the same evening, and the second reading is fixed for the 16th inst., when we may expect a lively debate. We are not without grounds for believing, however, that the Bill will pass, if not as it stands, in some modified form, more especially with respect to the power given to an Order in Council in Clause I., which many, who are otherwise favourable to the Bill, may think of too sweeping a character.

The extraordinary advance which has taken place in sugar since February—an advance which has not been equalled since 1876, in which year the beet crop was a failure—has come very opportunely. It shows the folly of our being so dependent upon the European production of sugar for our supplies. It may be that the very high prices now ruling will not continue beyond the summer, but that we shall have sugar high throughout the year may be taken as certain, and very probably throughout the greater part of 1890.

We have contended that the abolition of the bounties will not raise the price of sugar. Our largest imports are from Germany and Austria, and both these countries can, without any State aid, produce sugar to a profit, at prices which were ruling before the recent advance commenced.

What our sugar colonies want, is some security against the action of Foreign Governments, by which large quantities of sugar may at any time, and suddenly as in the case of Russia in 1886, be sent here and so demoralise the market. This fear is the cause of very large sums of money being kept back, which would otherwise be expended in improvements in the cultivation and manufacture of cane sugar. With these improvements cane can compete with beet, and the production would rapidly increase. Without such an increase we cannot expect to see a range of prices as in 1888 even. The beet sugar growers are now the masters of the situation, and will continue to be so so long as our cane growers are handicapped as they have been.

It is very natural to infer that the present high price of sugar will

lead to a large increase in beet sowing, and that next year we may look for a very large crop. We doubt very much if this proves to be the case; for the reason that the beet sugar manufacturers will find that it will pay them better not to materially increase their production, and so secure the enormous profits which present prices will leave them. Last year many German sugar companies declared dividends ranging from 30 to 60 per cent., after in some cases putting aside large sums against previous losses, or as a reserve fund. The same companies will probably this year show 60 to 100 per cent.

The recent rise in sugar, we repeat, comes very opportunely, as it shows better than words can do, that bounties and cheap sugar do not necessarily go together.

We have to go back to 1876 to find a parallel to the great advance which has this year taken place in sugar—the difference, however, between 1876 and 1889 is in the fact that the great rise in 1876 was the result of the failure of the beet crop, whilst no such reason can be assigned for the present rise; Mr. Licht's reduced estimates for the present European crop is within 5,000 tons of the largest crop known, viz., 1886-87, and 275,000 tons *in excess* of the crop of 1887-88.

There have been no more persistent opponents of the anti-sugar-bounty movement than the makers of preserves, who have contended that the abolition of the bounties would raise the price of sugar 2s. to 3s. per cwt., which meant ruin to their industry. Sugars within the past two months have advanced 7s. to 10s. per cwt., notwithstanding the bounties, and there is little doubt that these high prices will run through the preserving season, and if we are to accept their views, ruin stares them in the face.

Does not the present position of the sugar market present a powerful reason for the manufacturers of preserves to come over and help us to get rid of the effects of a system which every British statesman of eminence has in theory condemned? If bounties are practically abolished we shall soon see a large increase in the world's production of sugar, and correspondingly low prices; if bounties continue, we shall be every year more in the hands of the European beet growers; and further, is it not likely, in fact certain, that in time the Continental preserve manufacturer will obtain a drawback, and with it a bounty, on the sugar he uses, and so become a formidable competitor in this market?

Baron Henry de Worms, in his speech at Greenock, in November last, gave some figures showing the very great loss to the European beet countries by the operation of the bounty system, amounting in all to about £9,000,000, and our opponents have been very ready to accept these figures as the amount of bounty, and say, how is it possible for the sugar manufacturers of these countries to lose so large a sum without raising the price of sugar? As we pointed out at the time the bounty, that is, the difference between the actual duty paid and the amount of drawback was nothing like these figures; but if we take into account the higher price which the consumer in the bounty-giving countries has to pay for his sugar, in consequence of the bounty system, the Baron's figures are well within the mark. His words are, "The following figures will show the sacrifices foreign countries (not governments) make in order to maintain the bounty system."

The bounty at the present time on the export of German raw sugar is not more than about 1s. 3d. per cwt. She can produce it for export without the bounty, at 12s. per cwt. The present price is 23s. How is it that there is this large margin? It is because our cane supplies have failed us, owing very largely, though not entirely, to the check put upon the cane sugar industry throughout the world by European bounties.

The recent great rise in the price of sugar will aid the Government in passing a Bill to put an end to that which is the cause of it. The sheet-anchor argument of our opponents has been "if foreign Governments choose to send us sugar below cost price, we should be great fools not to let them." We are now feeling the effects of letting them.

The European sugar operators are now what many, who have closely studied the question, predicted would sooner or later be the case, the masters of the situation.

We have not discussed the merits of the Government Bill for the ratification of the Sugar Convention. It is impossible to draft a Bill of this kind which is not open to some objection, and perhaps reasonable objection. We have directed our remarks to those, and they form the largest proportion, who oppose any action on the part of our Government to do away with bounties, under the idea that to do so would necessarily raise the price of sugar in this country.

LORD SALISBURY ON THE SUGAR BOUNTIES.

Lord Salisbury, in response to a vote of confidence in the Government, at a meeting at the Salisbury Club, Bristol, on the 23rd ult., made the following allusion to the Sugar Convention:—

“With regard to the subject of the Sugar Bounties Convention, Baron Henry de Worms has been to a very large extent instrumental in carrying that through, and I hope it may be ultimately successful. It has many difficulties in its way, because, as you may imagine, the interests protected by bounty abroad do not surrender very readily; but the greatest difficulty we have to face is the impression which is created by some persons that our proposals are in some measure hostile to the principle of free trade. In our judgment this is the greatest possible mistake. We do not believe that these bounties have the effect of lowering the price of sugar to the consumer. They have an effect in putting money into the pockets of those who enjoy the advantage of them abroad, but that advantage which the manufacturers gave can only be transferred to the consumers if there is free unfettered competition, which there is not in this case. *Men will compete on such terms as they can against any disadvantages which they can measure, of which they know the extent and scope, but they will not risk their capital in competing for the possession of an industry which any foreign Government by screwing up its bounties a little can deprive them of in an hour.* That is the consideration which makes the whole and absolute difference between this and any other case in which we trust to competition to transfer the advantage to the consumer, and we believe the working-men are with us in the belief that the consumer does not get the advantage, but that it is kept entirely in the pockets of the foreign manufacturers and refiners. I have just said this merely to show that the matter is not absent from my mind, and that it was mere consideration for your time which induced me not to mention it. It is a matter over which we may have to fight, possibly for a long time, but I earnestly trust that the undertaking which has the full sympathy of the working-men of this country will be carried to a successful issue.”

THE SUGAR BOUNTY QUESTION IN THE HOUSE OF COMMONS.

On the 11th ultimo Baron H. de Worms, M.P., on behalf of the Government, brought forward the bill for the ratification of the Sugar Convention, which passed the first reading. The second reading is fixed for May 16, when Sir L. Playfair will move, as an amendment, "That this House is unwilling to create the discretionary powers required to give effect to the Sugar Convention of the 30th of August, 1888, until adequate proof shall have been laid before the House that those powers cannot be employed in such a manner as to restrict the importation and raise the price of an article of general consumption and essential importance to the masses of the people."

The following is the text of the bill, which is entitled, "A bill to enable her Majesty to carry into effect a convention made the 30th day of August, 1888, in relation to bounties on the exportation of sugar":—

Whereas Her Majesty the Queen and divers foreign powers have entered into a Convention, dated the 30th day of August, 1888, with the object of assuring by their mutual engagement the total suppression of open and disguised bounties on the exportation of sugar;

And whereas it is expedient to enable Her Majesty to carry into effect the said Convention;

Be it therefore enacted by the Queen's most Excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:—

1.—(1.) Where, in pursuance of article 7 of the said Convention, the fact of the existence in any country out of the United Kingdom of a system involving open or disguised bounties on sugar is established by the decision of a majority of the signatory powers of the said Convention, it shall be lawful for Her Majesty the Queen, by Order in Council, to direct that all sugar coming from the said country shall be prohibited to be imported or brought into the United Kingdom except in transit, and to make such regulations as appear to Her Majesty necessary for giving effect to the said prohibition.

(2.) Such regulations shall require the origin of all sugar imported or brought into the United Kingdom, whether in transit or otherwise, to be proved by such certificate of origin as is specified in the Order, and by such further evidence (if any) as the Commissioners of Customs, with the assent of the Commissioners of Her Majesty's Treasury, from time to time require.

(3.) While an Order in Council under this Act is in force, the laws relating

to the customs shall apply to all sugar which comes from the country named in the Order, and is not in transit, and to all sugar whether in transit or otherwise, the origin of which is not proved as required by the said regulations, in like manner as if the sugar in each case were specified in the table of prohibitions and restrictions in words contained in section 42 of the Customs Consolidation Act, 1876.

2. It shall be lawful for Her Majesty the Queen in Council from time to time to make Orders for the purpose of this Act, and to revoke and vary the same.

Every such Order, while in force, shall have effect as if it were enacted in this Act.

3. In this Act, unless the context otherwise requires—

The expression "sugar" means raw sugar, refined sugar, molasses, and glucose.

The expression "country" includes every country and place out of the United Kingdom, whether a foreign country or part of a foreign country or part of Her Majesty's dominions.

4. This Act shall be construed together with the Customs Consolidation Act, 1876, and may be cited as the Sugar Convention Act, 1889

Baron H. DE WORMS, who was received with Ministerial cheers, moved for leave to introduce the above Bill to carry into effect the Convention made on the 30th of August, 1888, in relation to bounties on the exportation of sugar. The signatories to that Convention, he said, were Great Britain, Germany, Austria, Russia, Holland, Belgium, Spain, and Italy, and he thought it well at the outset to contradict a statement which had often been repeated that Austria and Belgium were not signatories to the Convention. They were signatories, and the only reserve made by them was that if at the time the treaty was executed—namely, 1891—any number of European bounty-giving Powers were not parties to the Convention, they would have the right to reconsider their position. The present Bill was for the purpose of giving effect to that Convention; and it could not be sufficiently emphasised that the action of Great Britain in this matter could in no sense be said to be an isolated action. Great Britain could not put the Convention into force, nor could she act upon any of the conditions contained in the penal clause by her own individual effort. The "boycotting clause," as some persons chose to call it, was in no sense anything of the kind. It was a simple agreement arrived at by the country giving powers for the purpose of putting a stop to a system which, if it imposed upon them any great financial liabilities, imposed upon this country what was far worse—viz., the destruction of one of our most important home and colonial industries.

The case of America had been cited ; but America sent us hardly any sugar at all. At the present moment a large portion of our West Indian sugar went to America, and he asked the House to consider what would be the result when these bounties given by America out of the vast surplus which she had acquired by protective duties came into full working operation ? When her production had arrived at the point that she would no longer draw any supply of sugar from the West Indies, the inevitable conclusion was that our West Indian trade would cease altogether. It had been said that we were now taking a step towards Protection, but he would remind hon. members that though, under Clause 7, the signatory Powers were allowed to levy countervailing duties equal to the amount of the bounty, we were obliged to permit that, because we were the only Free Trade Power, and Protective nations claimed the right, if they chose, to impose countervailing duties. Countervailing duties had been adopted by hon. gentlemen opposite when Lord Palmerston was Prime Minister and the right hon. member of Midlothian (Mr. Gladstone) was Chancellor of the Exchequer, and in June, 1866, that right hon. gentleman made a speech in which he approved the Convention of Paris of 1864, the 19th Clause of which meant nothing but the imposition of a countervailing duty. Subsequently many conferences took place, but no practical result was arrived at owing to the fact thirt foreign countries did not carry the Convention into effect. He had observed that many gentlemen who said that bounties were bad things and ought to be abolished stated in the same breath that if we abolished bounties the result would be to raise the price of sugar. Which of the two would hon. gentlemen opposite elect to adopt ? (A HON. MEMBER: Both, and laughter.) He very much regretted that the hon. gentleman who said " both " was not in a position to introduce legislation on the subject. For his own part, he did not admit that the abolition of bounties would make sugar dearer, though he agreed that their abolition was necessary, and that they were essentially bad things. It was because Her Majesty's Government held that opinion, because they felt that these bounties pressed most unfairly on our industries, and that the first duty of English statesmen was to the trade of their own country and not to the trade of another ; that they were using every effort in their power to abolish them. It was a matter for congratulation that for the first time the great majority of the bounty-giving Powers of the world had, by a general consensus of opinion, agreed to the abolition of the bounties.

The Bill was extremely short and simple. It consisted of only four clauses, but the gist of it was contained in the first clause, which enabled Her Majesty's Government to give effect by an Order in Council to the decision of the majority of the Powers under the Sugar Convention, prohibiting the importation of bounty-fed sugar except from France. This was only to be done after the fact that bounties had been given was established by the decision of the majority of the signatory Powers, and while the prohibition was in force sugar coming from any country dealt with would come under the Customs Act, like false coin, pirated books, improperly marked cutlery, and other articles of the same sort. Clause 2 gave Her Majesty power to make further Orders in Council for the purposes of the Act; Clause 3 was simply one of definition, and Clause 4 was the title of the Act. The first clause was an exact copy of the clause in the Merchandise Marks Act, for which the right hon. gentleman the member for Sheffield (Mr. Mundella) had obtained so much credit, bounty-fed sugar having the same effect on the sugar trade as spuriously marked goods had upon other trades. He had in his hand a resolution passed by 59 trades unions, representing nearly 500,000 men, expressing gratification that the delegates at the conference had unanimously signed the protocol excluding from their respective markets all bounty-fed sugar. The whole bounty system was a terrible danger to our trade, and he was amazed that those who had the interest of the working classes at heart did not realise that fact. Moreover, the bounty system was increasing, and threatened to sap the very vitals of our trade. The subject was not in any way mixed up with party, and ought to be considered fairly. France gave bounties of different values on different classes of shipping, and the unpleasantness which had occurred between that country and England with regard to the Newfoundland fishery was due entirely to the effect of the bounty system. France granted bounties on the boats and on the catch—the total amounting to about 50 per cent. on the whole capital of the fishermen. Against bounties such as that it was impossible for poor men to earn a living by fishing on the coast of Newfoundland, and what was true with regard to fishing was equally true with regard to sugar. Those bounties were creeping up, and the time might come when bounties might be given by America upon manufactures. He should like to know if America were to devote a portion of her enormous surplus to subsidising industries which would compete with many of our local industries so as, in course of time, to absolutely

destroy them, what would be the action of hon. members from Lancashire, Leicester, and other great manufacturing centres.

The argument which had been used against these bounties was somewhat specious, and only required a little examination by the light of common sense to show its fallaciousness. It had been said that to do away with bounties would raise the price of sugar enormously, and that old women would be unable to obtain it for use in their tea and coffee. That would do very well for a hustings statement, but it would not bear the test of investigation. Who would venture to assert that the opening out of an enormous field of production rendered the article produced dearer? By abolishing bounties the sugar trade was being opened outward, and how could it be said that by so doing the price would be increased? They were told that the bounties given by foreign Powers found their way into the pockets of the consumer, but a more absurd statement had never been made. Bounties were given for the purpose of stimulating the particular trade on which they were conferred, and the reason why English producers could not compete was not on account of the low price to which an article was reduced, but because they knew that a 20 or 30 per cent. bounty might be used to undersell them, and thus create a dangerous competition. But it was said that when bounties were abolished sugars would rise in price. Why should they? Did anybody imagine that the sugar growing countries would cease to send sugar to this country, or discontinue their manufacture? Was it probable or possible that seven of the great sugar producing countries would sign a convention which meant the death knell of their business? The fact was, that the great sugar refiner would have to sacrifice a great deal of spurious profit and confine himself to the legitimate profit of his business. If the same quantity of sugar were still imported into England as now, he failed to see by what process of reasoning hon. gentlemen could imagine that sugar would become dearer. He remembered numerous questions put to the Government about allegations of combinations and syndicates. Why, if a monopoly were given to a certain number of foreign countries, the worst system of combination would be established. He had little reason to doubt that in some degree the rise of sugar at the present moment was due to the fact that yet higher prices were anticipated, and that there was in some parts of the Continent something like a corner. Had it occurred to hon. gentlemen that there might be a European war? When that war occurred, by the process of con-

scription the ploughshare would be beaten into a sword, and the beet cultivation would cease, and the production of sugar would diminish. If we neglected to open our own fields we should then have wilfully exposed ourselves to a dangerous rise in sugar. These were considerations which should be taken seriously to heart.

He had endeavoured, and he hoped successfully, to show that the cane industry was immensely diminished, that the supply of sugar from abroad was an unstable and dangerous one, that we had the means of developing to an enormous degree our sugar industries, and that for climatic reasons to keep a cheap sugar we must have other means of supply. The policy now brought forward was no new one; it was continuous. He asked the House to re-open old sources of supply, to develop new ones, to bring wealth and prosperity to our own shores, to give work to the industrious, and find it for the unemployed. They had come to the conclusion that the bounty system was disastrous to British industry, and those engaged in it had passed and were passing resolutions to that effect. The great voice of the country would, he ventured to say, support the Government in an honest and prompt endeavour to put a stop to a system which was detrimental to our industries, which was destructive of progress in our colonies, and was against the best principles of political economy, Free Trade, and common sense.

Mr. PICTON thought the scheme of the Government opened up a prospect of commercial war, as they might be invited to put a stop to bounties on other commodities as well as sugar. It was a scheme which was absolutely inconsistent with the great principles of Free Trade laid down by Mr. Cobden. So far as he understood, too, only two Powers adhered unconditionally to the treaty—Russia and Germany—

Baron H. DE WORMS said Russia, Germany, Italy, Spain, and Holland joined unconditionally. With respect to Belgium and Austria, the only condition they laid down was that if in 1891 all the European Powers were not parties they should have the right to consider their position.

Mr. PICTON said that at all events if they excluded Brazil and the United States, they were excluding some of the largest and richest fields for the production of sugar in the world. He quoted statistics to show that the sugar production of the West Indies and British Guiana had increased rather than diminished during recent years,

though it was quite true that more of it went to America and less came to us than formerly. The House was invited to enter on a course of ignoring one of the most important principles of Free Trade—viz., that the consumer was first to be considered, and in the name of the toiling millions he protested against this course. Something had been said of the resolutions which had been passed on the subject by trades unions, but he had more than a suspicion that this agitation, upon which large sums of money had been spent, was backed by persons acting in the interests of a particular trade and of a particular party. He earnestly protested against the introduction of this Bill, and would do whatever he could, at every step, to oppose it.

Mr. BURT thought that a *prima facie* case had been made out for the introduction of this Bill, and he intended to support, at any rate, the first reading, leaving himself entirely at liberty to consider any modifications which might be suggested at a later stage. The trades unionists for several years had passed resolutions against these bounties. It was said that the Bill was an attack upon Free Trade. He was himself a convinced Freetrader, but his definition of the principle of Free Trade was that no advantage should be given to, or disadvantage imposed upon, one producer more than another. That being so, he contended that bounties were quite as much opposed to Free Trade as tariffs, and that they were much more objectionable, inasmuch as they were offensive, whilst tariffs were defensive protections.

Sir G. BADEN-POWELL appealed to the House to agree to the first reading, and to postpone further discussion until the second reading.

Mr. ILLINGWORTH said that if the small number of those interested in the sugar industry were entitled to the protection of Parliament, and if on their behalf the House of Commons was to be asked to upset the policy they had persistently pursued for the past 40 years, why should not other industries also claim similar protection? England could bear the bounty system for a much longer time than those countries which had adopted it, and he should like to hear what the Chancellor of the Exchequer and the leader of the House had to say upon the question before the Bill was read a first time.

Sir L. PLAYFAIR had never heard a Bill on its introduction supported by a second reading speech. The right hon. gentleman had thrown down the gauntlet most distinctly, and said that the Government was going to enter into a system of general prohibition.

Baron DE WORMS said he had stated nothing of the kind.

Sir L. PLAYFAIR remarked that the right hon. gentleman had said that the question was not confined to bounties on sugar. No facts had been given to prove that the restriction of importation and the abolition of bounties were not likely to render dearer an article of food second only to bread in its importance to the people. It would be necessary to traverse the whole policy of the convention on the second reading, and he hoped that ample time would be given.

Mr. W. H. SMITH promised that ample notice would be given of the second reading. The Government recognised the right of the opponents of the Bill to have time for full consideration of its provisions, as the matter was undoubtedly of great importance. He trusted that the right hon. gentleman would accept his assurance that the question was one of the sugar bounties alone, and had no reference whatever to anything else. He hoped the House would now allow the Bill to be introduced, so that the Bill could be in the hands of hon. members. The second reading would be put down for May 16, when the date for the second reading discussion could be fixed.

Leave was then given to bring in the Bill (the Opposition ironically cheering the name of the Chancellor of the Exchequer as one of those prepared to bring it in). It was brought in by Baron de Worms, amid cheers and counter cheers, and read a first time; the second reading being fixed for the 16th of May.

NEW CANE DISEASE.

From *The Queenslander*.

The manager of the Colonial Sugar Company, Sydney, having learnt from Dr. Kottmann, who has just returned from a trip to Java, that a new disease, called "sereh," is devastating the cane-fields in that island, and the company, being advised by Dr. Kottmann to do all in their power to prevent the importation of Java cane to Australia, on account of the disease being infectious, have entered into correspondence with their representative in Brisbane with a view to preventing any more of this cane being imported. The Colonial Sugar Company consider the danger so great that they have destroyed a number of cuttings which they had recently obtained at some expense. These cuttings were a new variety, which was introduced into Java from Borneo in 1887, and planted in a district free from disease. The

manager of the company has wired to Mackay to stop any possible importation to that district, as he had heard that the Mackay planters were thinking of getting canes from Java. The matter having been brought under the notice of the Minister for Lands, he issued instructions to the Department of Agriculture to communicate with the members of the Planters' Association in Maryborough, Bundaberg, and Mackay, desiring their opinion in this matter, and asking whether they recommended that all importations from Java be stopped for the present. The Under Secretary for Agriculture has already done so, but has not yet received any reply.

Dr. Kottmann says the cane disease called "sereh" is considered infectious by a large majority of men in Java competent to form an opinion on the subject. It was first discovered some ten years ago in the Cheribon variety (Java), and canes in that colony, chiefly in the western sugar growing district; then it spread to the neighbouring districts of Tegal and Pekolonjan, and it has ravaged the districts of Solo and Djeoja in Middle Java. Eastern Java is as yet free from the scourge, but it is impossible to tell whether there also the plantations are not already infected with germs of this disease. Some mills have lost half their crops by it, and the crops in the districts of Solo and Djeoja were last season reduced by about 30 per cent. all round. These figures are extremely high in a country where formerly good crops were invariably obtained. The nature of the disease is not known yet, and great differences of opinion prevail regarding it. The cane plant when attacked grows more leaves than cane, and what stalks there are have many roots and side shoots, while the cane rapidly becomes over-ripe, and the ratoon crops suffer greatly in consequence. To remedy the evil, the planters in the infested districts procure plants from the unaffected district or from Borneo, and the owners of some mills, capable of turning out 3000 tons of sugar in a season, now spend £3000 or £4000 yearly in obtaining fresh plants, and no charge is made for the transport of these plants on the Government railways. The following is an extract from Dr. Kottmann's letter to the Colonial Sugar Company on the subject of the new disease in sugar cane:—

"I have sent you from Thursday Island the following telegram, under date 3rd November, 1888:—'Strongly advisable to destroy cane plants received from Krause, Batavia, as sereh disease probably infectious. Am going Goondi.' Although Mr. Krause has prudently

procured the plants from the mill Kalibagor, situate in a district which is yet totally free from sereh, I had to consider it my duty to warn against planting them. In the districts which suffer from sereh, this disease is believed to be infectious, and after what I have heard and seen I am very much inclined to be of the same opinion. Dr. Kruger, of the Trial Station, Kagok, says that he and Dr. Soltwedel have never been in doubt about this point, and an instance how practical men dread this disease may be the following :—Mr. Van Soest is the only owner of the above mill, Kalibagor, which he took partly over when sugar mills were set down at a higher figure than now-a-days. This mill, however, producing the highest quantity of sugar in Java per acre—namely, $5\frac{3}{4}$ tons on an average, makes enormous profits, which, this year for a production of 4000 tons high class sugar, will be about £18,000, or £4 10s. per ton sugar, when not calculating the interest on the value of the mill and on the working capital. Mr. Van Soest, when speaking frankly on his situation, said that he now needed only one or two years more of similar success, and his position would be fully secured and independent. I replied that, considering the wonderful results of the last year, there was scarcely any reason to fear the contrary. He then replied that the sereh might yet get into his cane. Thus a sugar grower, far off all infected districts, who has yet the soundest cane, and who, in fact, is visited from all parts of Java for the renown his successes in the cultivation have gained in this island, even he does not feel himself quite secure against the sereh. My opinion on the position of Australia as regards it is in short this, that with a view of securing the colonies against the disease, prohibitory measures should be taken by the various Governments against the importation from Java of any cane-stalks or plants or other matter to which the disease might cling, until such time as disease has either disappeared or is proved not to be infectious. The advantage of having cane from Java tried when comparing varieties from different sugar growing countries is, I think, very small, as compared with the risk which, under the present circumstances, is possibly connected with the importation of cane from Java.”

VILLE'S MANURE FOR SUGAR CANE.

(From the *Queenslander*.)

About four months ago a notification appeared in these columns (remarks the *Sydney Mail*) to the effect that the well known French agriculturist, M. Georges Ville, had invented a new manure for sugar cane. The effect of this novelty on sugar crops was said to be somewhat extraordinary, and many of our friends in the North expressed a wish for further particulars, especially as to what were the constituents of the manure. We forwarded a letter to M. Ville on the subject, and he has most courteously furnished us with the following particulars. He says:—"The manure which I recommend to be used for sugar cane is manure No. 5, composed of superphosphate of lime, 400 kil.; nitrate potash, 200 kil.; sulphate of lime, 400 kil.; total, 1,000 kil. to the hectare. It is often advantageous to add to this manure 100 kil. sulphate of ammonia per hectare. The improvement which I have introduced during several years in the use of chemical manure for all kinds of cultivation, consists in the extraction from the atmosphere of the greater part of the azote necessary to the development of crops, which in consequence gives a great saving, as azote is the dearest ingredient in chemical manures. Many plants, principally those of leguminous family, such as trefoil, rejoice in the power to take from the air all the azote they require. We have experimentally proved this for thirty years, and the agricultural profession have always confirmed this phenomenon. I have founded upon this power of leguminous plants a method of cultivation which I call 'La Sidération,' because it is under the influence of the sidereal force of the sun, which produces the fixation of the azote. The principle and the applications of this method are given in a book edited by M. T. Masson, 120, Boulevard St. Germain, Paris, and styled 'Le propriétaire devant sa ferme délaissée.' The principle is to cultivate a plant which takes its azote from the air, and to bury it so as to furnish to a crop the azote which is necessary to it. But, for this plant-collector of azote to give all its good effects, it must be put for awhile with scattered mineral manure, without the azote (incomplete manure No. 6), which is composed of superphosphate of lime, 400 kil.; chloride of potassium, 200 kil.; sulphate of lime, 400 kil.; total, 1,000 kil. per hectare. With this manure leguminous

plants thrive grandly, absorb a considerable quantity of atmospheric azote. We ought to bury the plants at the time when they are flowering, because after this time they will be slow to decompose. The earth receives by this means all those elements of fertility contained in the complete manure (understand?). The phosphoric acid, the potash, and the lime which is given under incomplete manure No. 6, and absorbed by the leguminous plants, are afterwards given to the soil by the burying of these plants. The azote, the most precious ingredient in the air, makes all cool, and that which is condensed in the tissues of the vegetable disengages itself during the decomposition in the soil of organic matter which serves as nutrition of crops. To apply this principle to the cultivation of sugar cane, you must sow between the lines which you are planting leguminous plants, such as peas, trefoil, beans, or other plants; choose from those which thrive the best in the Australian climate, and with a very developed foliage. Sprinkle it on the earth, and put with the superficial couch grass 1,000 kil. of the incomplete manure No. 6, of which I will say more. The vegetation of this plant is nothing like that of the cane, and when it comes to the flowering stage bury it with a plough. If the vegetation of this first plant is rapid enough, it would be possible to push a second growth (or crop) either of the same plant or of another plant of the same family, and always give mineral manure, and proceed in the same manner for green crops. If the circumstances permit of this second culture, employ a plant other than leguminous. The useful effect will not be less if you choose a plant of rapid growth, and moist and spongy, and if you give 100 to 150 kil. of sulphate of ammonia per hectare. You ought also to bury when flowering or before this period in all cases, or the trunks will harden and become ligneous. We produce in this way enormous quantities of azotid manure, which, with the minerals employed, form a manure so rich that the hardness of the canes will be found to accrue during several years. It is another of the good effects of chemical manure that it augments the soil annually. I have obtained, in Egypt, up to 100,000 kil. and 110,000 kil. of the canes per hectare. To obtain the maximum result I propose to employ the siderol manure in full—the complete manure No. 5—which is, superphosphate of lime 600 kil., nitrate of potassium 200 kil., sulphate of lime 400 kil., total 1,200 kil. per hectare.” In connection with the numbers given in this report, a kilogramme is reckoned at a little more than two pounds avoirdupois, and a hectare at two and a half acres, so that when M. Ville speaks

of so many kilogrammes per hectare, it is calculated as the number of acres in a hectare. The prices at Elliott Bros., of this city, of the principal compositions mentioned by M. Ville are : superphosphate of lime, 6s.; nitrate of potash, 30s.; sulphate of lime, 10s. per cwt. respectively.

ON SACCHARINE MATTER IN MORTAR, AND ON BUILDING IN FROST.

BY SAMUEL CROMPTON.

In my communication printed on the 19th I spoke of some building just done in sharp frost. The courses of brickwork set in the wall with sugared mortar are perfectly sound, and are untouched by the frost and by the thaw that followed it; whilst the work below it, and the work done on the same day that the sugared work was done, but done with unsugared mortar, has suffered severely. So that it is proved, that by using sugar in the mortar, building can be safely done in frost—and in sharp frost, too. I have said already that the village sand is, in my opinion, not a good sand for use in frost.

If powdered flint, or if powdered limestone, or if a sand white and glistening and sharp had been used, I have no doubt that an equally good result would have been got with half the quantity of sugar, and probably with much less. But if the same amount of sugar had to be used that was used in this case, would it be an expense worth regarding when we reckon against it the great misery and privation which occur, in severe and long-continued frosts, among all the people employed in the building trades? To this is to be added the great inconvenience felt by those who wish their buildings to be completed, and who are baffled by frost.

So far I have spoken only of the possibility of building in frost; but another great advantage of using saccharated mortar is that in all building done, say, from the end of October till May, all anxiety as to harm that may come from frost at any time is entirely removed, if certain conditions of a simple kind be observed. When the lady invited her friends to come and taste some of the first tea that had come into England, she did not proceed scientifically, for she threw away the liquor, that is, the tea, and treated her friends to the boiled leaves. It seems to me that most of the mortar made at the present

time is as unwisely made as this lady cooked her tea. If the same insane plan of making it that is so largely adopted be employed in frost, there will not be success except by using a larger amount of sugar. It is perfectly plain to me that one great cause of goodness of Roman mortar was that they slaked the lime in pits and allowed it to remain there for two or three years before they used it. Here is the proof. I quote from Dr. Philemon Holland's translation of Pliny. Pliny was born in the year A.D. 23. He published his book in the year 77, that is, more than 1800 years ago. He says: "And, verily, the greatest reason that cities fall to decay and be so ruinat is this, that mortar the elder it is, the better it is found for building. Moreover, in the old laws which provide for the perpetuities of houses in ancient time, we find it expressly set down that the undertaker to build at a certain price shall use no mortar under three years of age; and this was the reason that in those daies a man should not see any roughcast or parget to rise or chawme so illfavouredly as now they do."

Philemon Holland made his translation in 1634; so that after knowing this for upwards of 250 years, we Englishmen, full of admiration of the wonderful mortar of the Romans, have deluded ourselves into the belief that the Romans used hot lime. Pliny, like myself, was not a practical man, therefore he is, I think, to be understood to say that the lime was slaked and allowed to stand for three years to get it into a perfect state, but that the sand was not added except as and when that slaked lime was needed for building with. Herein is one of the great and one of the chief secrets of that old Roman mortar. In a field at Lincoln, not far from the Cathedral, I saw last year a mass of Roman masonry, mostly concrete, as hard to this day as possible: and likely to remain so for thousand or two thousand years to come. I examined the walls of the castle built by William the Conqueror, and here I found the mortar inferior. It will be said that his mortar had not had time to grow hard, but such an opinion is utterly groundless, as I hope to be able to convince the building world. The Conqueror's mortar had fallen out from the joints, but had evidently been pointed within the last few years. This plastering or pointing was so rotten that the point of a knife entered it as easily as it would have entered into, not a cheese, but the frailest confectionery. I have no doubt that whoever did this pointing, intended to do it well, and that either in the weather when he did it, or with our insane notions about hot lime, he was misled.

What a chorus of disapprobation there will be when what I have written is read ! One will say, "Who does not know that lime, the fresher it is the better ?" I answer that lime, the fresher it is, and the earlier it is dealt with after it leaves the kiln the better it is.

Another will say, "But if it be fresh, it will be hot when it is slacked ; and the fresher, the hotter." I believe so too. I am sure it will.

Another will say, "I have been amongst mortar all my life ; I have used thousands upon thousands of tons of it, and surely I ought to know something about mortar. He will never persuade me that mortar, that has been left in a pit slacked for three years can have any virtue left in it. No, no ; this opinion of his is simply nonsense, sublimated nonsense. Besides, is the nation and all building to be kept at a standstill for three years, till we wait for the mortar to be Romanised ? Tut, tut ! mere moonshine."

My answer is that I made no such proposal, but that if engineers and architects also had kept on the old lines all the work that they did would have been perfect, so far as perfect work depends on lime only. But knowing that lime that had been slacked for three years could nowhere be found, I said that ground lime should be used, and I say that the more finely ground that lime is, and the better it will be. If newly-burnt lime be used at a building where a mortar mill is on the ground, that lime ought to be ground with water and not dry ; and the longer the grinding goes on, the better and stronger the mortar will be that is made with it. But, observe carefully, that the sand should never be ground with it, but be added afterwards when the mortar is made for each day's use ; and that it will be found that the shorter the time that passes between the mixing and the using of the said lime—that is to say, of the mortar—the better it will be and will work ; and with some sugar or treacle added to it, if the right sand, or what I propose as a substitute for sand, be added, it will, for plain mortar, be equal to every ordinary or common purpose.

The objector will say, "This man has sugar on the brain," and he will drop the *Engineer* upon his knee and say to his wife, "My dear, what do you say to this ; here is a man wanting to persuade us that we ought to put sugar into our mortar." "Gracious !" she will say ; "sugar into mortar ? I never heard of anything so ridiculous." And he will answer, "Neither did I," and will add, "you had better lay in a few hogsheads of it before the price goes up." He will take

up his *Engineer*, and go on reading, saying at the same time to himself: "I have begun this rubbish, and will read it through." If I were there I would say, "Don't be alarmed, madam, I will tell you a little story. Many years ago, there was a man they called a quack. His name was Solomon, who sold what he called 'Balm of Gilead.' Solomon was really a doctor of medicine, and had been educated at one of our universities. An old fellow-student, a physician, met Solomon in Cheapside, and drew him into a doorway and begged him to give up advertising and selling his Balm of Gilead. Solomon said, 'Look at all these people who are passing this door; how many of them, think you, are wise men?' I forget whether the physician said, 'Perhaps one in a hundred,' or 'one in a thousand,' the point of the story is this: that Solomon replied, 'Well, then, you take the wise one, and leave the others for me.' I am on the look out for the wise man. It will be difficult to find him; so you may dismiss any fear that the price of sugar can rise by anything I say. Your husband, madam, has hot lime on the brain, as I have sugar. Once I, too, believed in hot lime; but now, if I possessed a limestone mountain or a chalk one, with coal at hand, and a valley of my own, I would make brick-pits and would shoot the hot lime into them and pour water upon it till it would take up no more, and till the water stood above it, upon which water I would pour either oil or tar, and would take care that the lime never got uncovered with a layer of water. If I wished to hasten the process, I would first grind the hot lime and then proceed as above, directing that a man should pass down into the mass an iron rod at intervals of a few inches and every few days, so that the water would penetrate thoroughly. Not sooner than three years would the former be fit for use, but the latter would be so in six months. Neither planting nor mining would pay so well as this. By my will and testament, madam, I would leave all to my widow. It would be a mine of wealth to her and her heirs. The longer it was kept the better it would be, if the covering of water and of oil or tar were kept upon it. The architects would fight for it. In their specifications they would say, 'Dash's Crompton lime, five years or ten years, &c.' The lady would quietly say, 'Well, your will would be a warm-hearted one, and your lime would be effectually cooled; but how about floods?' Oh! those I would guard against in this way: I would get one opinion from a kid-gloved engineer and another from one who does not wear gloves. I would take the mean between the areas they reckoned sufficient for water contingency, and that number I would multiply

by fourteen. The theological golden number is seven ; but my mortar golden number is fourteen. Then I think I should be safe. A valley a few miles long of such a series of pits would be a mine of wealth indeed. ' But,' she will say, ' you forget that we are antiquity, and not the men of 2,000 years ago. You forget that my husband is a depository of the knowledge and experience of all past ages and must know that hot lime is the strongest and best.' Madam, your remark is a most sagacious one, and I can see plainly that you have solved many a difficulty in your husband's career. But the ancients made better ink than ours. I have seen documents written hundreds of years ago, where the ink remains perfect, and is as black as a raven. They are few, it is true. But in my examination of documents regarding inks, a deed written between thirty and forty years ago was shown to me where the ink had almost perfectly faded. May it not be that we are wrong in our mortars ? May not even the fancy mortars of this day begin to show shortly signs of decay ? They do show it daily ; and I believe it will come to pass that this period of building in England is not a creditable one—nay, rather a bad one ; for where strength has been got it has been obtained at a needless and extravagant cost ; and as Mr. Burrell says, or what he says amounts to, is that we are at sixes and sevens, and the prey of doubtful doctrines. I feel sure, madam, that if a lady had such an inheritance of a valley of several miles long of such lime, Mr. Beagle, her steward, would tell her that they could not supply it fast enough, and that as the lime came out of the vats it cut like brown soap, and that not a particle of grit could be seen or felt."

Dreams are things that we cannot order or anticipate. But we may imagine that madam dreamt that she saw her husband filling up the large artificial lake in their grounds, by a staff of a hundred men, with hot lime ; and that she told her husband her dream, who said, on hearing it, " And what did you do, my dear ? If I had dreamt that I was doing it, I should have looked over my shoulder from time to time to see that you were not watching me, or expected to see you come with your hair down, in your dressing-gown and without stockings ; and then what a scene !" " No, my dear," she would say, " you are quite mistaken ; I should have taken it quite calmly and composedly."

It seemed to me to be necessary, in preparation for what is to follow, to state my case as I have done. In my next communication

I will state the scientific grounds on which my opinion rests. I must warn practical jokers who use the sugared lime solution which I allowed to Mr. Faija for his mouth, that it would probably be dangerous to swallow much of it, or any but a very small quantity of it. In conclusion, I will ask all engineering and architectural pupils another question: Stir into a quart of water two or three ounces of quicklime. When the liquor is clear, pour it into two tumblers. Blow through a tube into one of them, and do so once or twice a day. Observe both. Taste both from time to time. What is the bearing on mortar of what you have seen? If education in England were what it ought to be, such questions would be childish. But I know what our education is; indeed, I know it too well.

SAMUEL CROMPTON.

Cranleigh, Guildford, January 30th.

From *Engineering*.

WATSONVILLE BEET SUGAR FACTORY, CALIFORNIA.

The following interesting particulars of work done at this factory for the year ending December 19, 1888, are furnished by Mr. C. Spreckels, and are taken from the *San Francisco Merchant* of April 12.

The quantity of sugar made was 1,640 tons of 2,000 lbs., at a cost of \$80·80 per ton, equal to 15s. per cwt.

The following are the items:—

Sugar freight from Watsonville to San Francisco ..	\$ 2,937·55
Coal, total cost	17,267·00
Coke, total cost	1,758·93
Fuel oil, total cost	11,356·02
Wood, total cost	900·50
Lime rock, total cost	1,780·30
Sugar bags, total cost	1,740·34
Soda, total cost	12·39
Tallow, total cost	57·21
Expense, labour, &c.	21,091·27
(Beets) incidentals	2,575·82
Cost of beets	71,055·89

\$132,522·22

The amount received for the sugar produced was \$162,454·70, leaving a credit balance of about \$30,000, or a profit of 5s. per cwt., or 33½ per cent. upon the cost, in which, however, nothing appears to be put down for depreciation. The capital embarked in this factory is not given. As this result will be upon prices before the recent advance, it is clear that the beet sugar industry in California has a future before it, unless the duties upon sugar are reduced, and no equivalent given to the domestic producer.

SUGAR BOUNTIES AND THE PRICE OF SUGAR.

BY PROFESSOR J. SHIELD NICHOLSON.

The supporters of the proposed Sugar Bounties Convention have to meet two arguments. The first, and most important from the point of view of public policy—namely, that the proposal is a step towards Protection, was examined in a former paper. But even if, as was contended, the Convention does not offend against our Free Trade principles rightly understood, it may still be objected that it is inexpedient on the ground that there would be a great rise in the price of sugar, which would injure the consumer and the trades, such as confectionery, which use sugar as their raw material. It may be useful, then, to put forward in a plain way the general principles which determine the effects of bounties upon price, and to consider what would probably happen if the natural course of trade were restored. The primary object of a bounty, as Adam Smith pointed out, is to enable a trade to be carried on profitably which otherwise would not be carried on at all, or at any rate, to the same extent. It would obviously be absurd to give a bounty on any commodity which could be produced and exported under natural conditions. M. Thiers put the case in a nut-shell when, in reply to the question why he supported bounties, he said: "Because I love to see the tall chimneys smoke," and he evidently believed that without the bounties the tall chimneys would not smoke. But chimneys will smoke fast enough, if the owner obtains the fair rate of profit current in the country. More than the ordinary rate cannot be obtained for any length of time because competition would be stimulated. It follows, then, that as soon as the bounties have had time to produce their full and natural effect, those for whose benefit they are devised will be earning only a fair return on their capital, and any exceptional profit will be neutralised through a fall in price.

The sugar refiners in this country maintain that not a single ton of refined sugar would be imported if the bounties were abolished, and even under present conditions apparently about twice as much is refined in this country as there is imported of bounty-fed refined sugar. If the first contention is correct, it would follow that in sugar-refining as in many other things the foreigner cannot work so cheaply as his British rival, and that a considerable part of the bounty must be consumed in making up his ordinary profits. It is plain, however,

that this part of the bounty cannot at the same time lower the price and also raise profits—that is, it cannot at the same time flow into the pockets of the foreign manufacturer and into the pockets of the British consumer. It must be remembered, also, that the foreigner can only obtain this bounty on exports, for the bounty generally takes the form of a drawback, by actually exporting—that is to say, he can only obtain his profits by selling in a foreign market. Accordingly, it is theoretically quite possible that large quantities of bounty-fed sugar might be sent to this country with a very slight effect on the price when equilibrium is established. The result might simply be that a certain amount of Foreign pushes out of the market a certain amount of British sugar, and that any attempt to recover the market for the latter would lead to a fall in prices.

This view that only a small part of the bounty goes in a reduction in price, the rest being swallowed up in profits, is confirmed by the fact that sugar-refining has been carried on in this country throughout the whole period during which the bounties have been given. Had the effect on the price been so great as to take away all profit from the British refiner, this would plainly have been impossible. At the outside, then, the difference in price due to the bounty cannot by any possibility exceed the ordinary rate of profit, which in this country is sufficient to induce sugar-refiners to keep their works going. For if the price fell, owing to the bounty, by more than that amount the British refiner could only produce at a loss. But no industry could be carried on for a period of twenty years with no profits and with a constant drain on capital.

It is important, then, to estimate even roughly the rate of profit which would enable sugar-refining to flourish. It is stated, on good authority,* that a margin of 6d. per cwt. would yield such a handsome profit that capital would be attracted to the trade. Now 6d. per cwt. is about the eighteenth part of a 1d. per lb., and the highest estimate given of the annual consumption of sugar per head of the population is 72 lb. It follows, then, that an increase in price of 6d. per cwt. would burden the average consumer with 4d. a year additional expenditure; or, taking the usual proportion of five to a family, 1s. 8d. will be the additional burden on a family—1s. 8d. a year being less than $\frac{1}{2}$ d. per week. When it is further

* I have been indebted for the figures quoted to various pamphlets by Messrs. T. Neill, Greenock; G. Martineau and N. Lubbock, London.

remembered that with or without bounties the price of sugar must vary from natural economic causes, when we observe in the last four years oscillations of 50 per cent., it is plain that the consumer would never feel this additional 6d. per cwt., which is not 5 per cent. of the price.

But there is good reason to believe that the rise in the price due to the abolition of the bounties could not amount even to this sum. For 6d. per cwt. is a handsome return, and, as already pointed out, refiners in this country who have continued to carry on business must have been earning some profit. The natural effect of competition would soon reduce a handsome to an ordinary rate of profit, so that eventually the effect on price would be represented by the difference between the rate of profit at present earned in sugar-refining (that is, taking the average of a term of years) and the ordinary rate of profit in trading capital. But for some time, owing to a variety of causes, the ordinary rate of trade profits has been falling, and the present rush of new companies shows that there is a superabundance of capital seeking investment. It may then be fairly assumed that the price of sugar would very quickly be adjusted, so that only a moderate return on capital was forthcoming. Perhaps, then, it would not be far wide of the mark to assume that 7 per cent. additional profit would be considered quite remunerative, and using the figures taken before, this would mean a rise of less than 3 per cent. To make the matter quite clear, it may be mentioned that in these calculations it is supposed that a capital of £150,000 employed in refining could turn out 1,000 tons a week. Thus a rise of 6d. per cwt. (other things remaining the same) would mean a profit of £26,000 per annum, which is at the rate of 17 per cent., and which is plainly too great to remain stable. If, then, sugar-refiners have only been earning 3 per cent., a rise of 3d. per lb. would give them more than 10 per cent., and if they have been earning more than three per cent., and 10 per cent. may be taken as the normal rate of trade profit, by so much less will the price of sugar rise.

The probable or possible rise in price which would follow on the abolition of the bounties has now been reduced to very moderate dimensions, but it is doubtful if even yet a further reduction in the dreaded rise ought not to be made. In the first place, the natural effect of bounties is to increase the uncertainty of trade. Thus, even supposing the growers of cane sugar find present prices remunerative, and, if they were likely to continue, they would extend their business. They will not do so when they are afraid of a further increase in

bounties on beetroot. Hence it is quite possible that the abolition of the bounties would lead to an increase in the production of cane sugar, and ultimately to a fall in price. Again, by the artificial encouragement of beetroot, we depend more and more upon that source of supply, and in bad years there may be a considerable rise in price. If, on the other hand, the area from which supplies are drawn was extended, as is the case with corn, for example, greater steadiness of price might be anticipated, and greater steadiness would involve a lower rate. It must also be borne in mind that the very object of a bounty is to enable the country which gives it to cripple and injure, and, if possible, destroy the trade of its rival. If the sugar bounty system were carried to its logical conclusion, the result would be to shut up our refineries and ruin our plantations. It would be an expensive process for the nations which attempted it, but there is no doubt that a high enough bounty given by the foreigner would destroy any particular industry which had not exceptional natural advantages. But when once the bounty-giving nation or nations had obtained a practical monopoly they might, especially in this age of syndicates, unite to raise prices. An industry that is completely broken down cannot be valued at a moment's notice, simply because there is a rise in price, especially if it is known that the rise is due to artificial causes. Thus, if the Convention fails and the bounty-giving nations extend their policy, and bounties, like protective duties, tend to grow, the consumers in this country may ultimately have to pay a good deal more than if the bounties were abolished.

In conclusion, it must always be remembered that it is not proposed to lay any duty on the importation of sugar, except as regards any nation which still persists in giving bounties. The total amount of sugar produced in the world annually is now probably nearly five million tons per annum; whilst the amount which we import from France is only about 80,000 tons. Accordingly, if France alone rejects the Convention, we shall still have the markets of the world open to us for about 98 per cent. of the total production. And, to revert for a moment to the argument of the former paper, it is surely altogether beneath the dignity of a great nation—which, for half a century, has invited the nations to follow its lead in Free Trade—to refuse to assist in abolishing the worst form of the old Protectionist system, simply because it supposes that for the time it obtains a paltry benefit.—*The Scotsman*.

THE PRINCE OF WALES ON OUR COLONIAL EMPIRE.*

TWENTY-FIRST ANNIVERSARY OF THE COLONIAL INSTITUTE.

On the 13th February, the PRINCE OF WALES as President of the Royal Colonial Institute, presided at the Hotel Metropole, over a banquet to celebrate the 21st anniversary of the foundation of the Institute. The company present was a numerous and representative one—including His Royal Highness the Duke of Cambridge, the Duke of Manchester, Lord Knutsford, Earl Rosebery, Earl Carnarvon, Earl Kimberley, Lord Herschell, Lord Brassey, Lord Kinnaird, Viscount Bury, Lord Napier of Magdala, and Sir P. Cunliffe Owen.

The loyal toasts having been honoured,

The PRINCE OF WALES, in returning thanks, said—I appear before you to-night more especially in the capacity of President of the Royal Colonial Institute—a position which I have had the honour of holding for eleven years. You may be assured that I take the deepest interest in the Institute, and feel very proud to be connected with it, and in that way to have to take an interest in all that concerns our great and important colonial possessions. I am also glad to have occupied the chair to-night at this very great and influential gathering for the purpose of celebrating the coming of age of the Institute. I shall have later to make some remarks concerning it when I propose to you the toast of the evening. With regard to the colonies, I have to a certain extent visited some of them. Many years ago now—I am sorry to say—I had the advantage of visiting our great North American colonies, but since that time enormous changes have taken place, and they have immensely developed, so much so that perhaps I should hardly recognise them. I take the deepest interest in their welfare. It is the duty, if possible, of every Englishman, and above all, of every statesman to visit those colonies. It will prove to them how proud we may be of the Englishman, and see what the indomitable energy of the Englishman can do.

The PRINCE OF WALES next proposed “The Naval and Military Forces of the Empire.” The colonies were, he knew, doing all they could for the protection of themselves, but at the same time they had shown a spirit of attachment to the mother country—and during our recent small wars they had shown a desire to assist us in our military

* Unavoidably omitted last month for want of room.

operations. He alluded to the South Australian contingent which was sent to the Soudan. Offers of assistance from other colonies had also been made. Few questions had been more directly in discussion at the Institute than the national defences of the empire, which were so essential for the protection of this country. It gave him the greatest satisfaction in connecting with the toast of "Our Military Forces" the name of his illustrious relative, the Commander-in-Chief. For many years he had presided over the destinies of the army, and his interest in it would never diminish. With the "Navy" he coupled the name of his gallant friend, Lord Charles Beresford, who, as they were aware, took such a deep interest in that branch of the service.

The Duke of CAMBRIDGE having responded for the Army, and Lord CHARLES BERESFORD for the Navy,

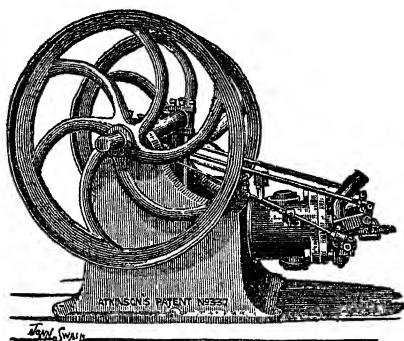
The PRINCE OF WALES proceeded to propose the toast of the evening. His Royal Highness said—As you are aware, we celebrate to-night the twenty-first anniversary of the existence of the Royal Colonial Institute. Those who are not members of the Institute will naturally ask, what are its duties—for what object has it been established? I may state that one of its principal objects was brought about by the desire of its promoters to combat the teachings of a certain set of politicians in this country, who contended that our colonies were a source of weakness and encumbrance to the mother country, and that their separation from Great Britain would be rather an advantage to the country than otherwise. The idea is crude, and I am happy to believe it is almost entirely exploded. There are few people in these days who entertain opinions of a similar kind. This Institute, in its discussions of colonial questions, and its influence on public opinion, has in some measure, I hope, contributed to bring about the greatly improved feeling which now prevails, at which we so greatly rejoice. We regard the colonies as an integral part of the empire, and our warmest sympathies are with our brethren beyond the seas, who are no less dear to us than if they dwelt in Surrey or in Kent. Mutual interest as well as ties of affection, unite us as one people; and so long as we hold together we are unassailable from without. I may say that from a commercial point of view the colonies and India are amongst the best customers for home manufactures, it being computed that no less than one-third of our total exports are absorbed by them. They offer happy and prosperous

homes to thousands who are unable to gain a livelihood within the narrow limits of these islands. In transplanting themselves to our colonies instead of foreign lands, our people retain their privileges as citizens of this great empire, and live under the same flag as subjects of the same sovereign. As Professor Seely in his interesting work remarks, "Englishmen in all parts of the world remember that they are of one blood and one religion, and they have one history and one language and literature." They are in fact the vast English nation, and we should take great care not to allow the emigrants who have gone forth from among us to imagine that they have in the slightest degree ceased to belong to the same community as ourselves. Lessons like these the Institute has continuously striven to inculcate. It has endeavoured to preserve a permanent union between the mother country, and after encountering many difficulties, it now rests on sure foundations, and has succeeded in obtaining public confidence in every part of the world. It offers every facility to the colonial visitor to England, affording him assistance in every way. It also forms an important centre for the dissemination of information to intending emigrants of every class, and to all persons making inquiries on any subject connected with the colonies, whether members of the Institute or not. The remarkably small cost at which the work of the Institute has been carried on is most creditable to those to whom the control of its funds has been intrusted. It has been computed that the entire sum expended during the last twenty-one years has not exceeded £50,000, whilst it possesses property which will be worth as much more when the existing mortgages have been paid off. I notice with much gratification the paragraph which appears in the last annual report relating to its recommendations on the subject of the scheme for mutual co-operation between your Institute and the Imperial Institute. If these suggestions are adopted, they will tend to the advantage of both Institutes; and at the same time I can confidently and emphatically assure you that nothing in the nature of absorption of the Royal Colonial Institute by the Imperial Institute, an institution in which you know I take a deep interest, is involved in such a scheme, as appears in some quarters to have been supposed.

The toast having been duly honoured,

The Earl of CARNARVON proposed "The United Empire."—Lord KNUTSFORD responded.—The company shortly afterwards separated.

ATKINSON'S PATENT "CYCLE" GAS ENGINE.



From a Photo of a nominal 2-H.P. Engine.

LICENSED MANUFACTURERS.

MESSRS. MANLOVE, ALLIOTT AND Co. (Limited).

It is only some twelve years since gas engines of any important type were introduced. The enormous number of them now in use is a clear indication of the great want which they are able to meet. It is not surprising that during these years great improvements have been made in their construction.

Although for obvious reasons gas engines have not been used in crushing canes, gas is now so largely used in the Colonies that the subject is one of interest to our Colonial readers. Where public gas is not easily obtainable, Dowson gas is readily and cheaply made, and where 4-H.P. and upwards is required the cost of fuel for a given power is very considerably less than where coal is used. The apparatus in which the gas is made is very compact and requires no skilled labour to handle it, and it is not likely to get out of repair. The gas made has a blue flame, and is not suitable for lighting purpose; but besides driving gas engines, it can be used for cooking, heating, laundry, and a variety of similar purposes.

We have, therefore, pleasure in calling the attention of our readers to a description of the "Cycle" Gas Engine (an illustration of which we give at the head of this notice), and to some of the advantages which it possesses over other makes.

The 6-horse-power Atkinson's "Cycle" gas engine has a cylinder $9\frac{1}{2}$ -in. in diameter. By means of the link work the piston has

imparted to it four strokes for each revolution of the crankshaft. These strokes all vary in length, being as follows: Suction stroke, $6\frac{1}{16}$ -in.; compression stroke, 5-in.; working stroke, $11\frac{1}{16}$ -in.; and exhaust stroke, $12\frac{5}{8}$ -in.

The cycle commences, say, at the end of the exhaust stroke, the piston at this time being as close to the end of the cylinder as is compatible with safety, thus driving out practically all the residuum, which is still further cleared out by the momentum of the exhaust gases in the exhaust pipe dragging a little air through the passages and small clearance space left. From an economical point of view it is now pretty well understood that the total elimination of the burnt gases is a desirable feature, in fact engines have recently been made which sacrifice an entire revolution for the purpose of obtaining this desirable object.

A short suction stroke is now made followed by a slightly shorter compression stroke, the difference in the lengths of these strokes leaving a chamber into which, together with the clearance spaces, the charge is compressed. At this time ignition takes place and a long working stroke is made, followed by a slightly longer exhausting stroke when we arrive at the completion of the cycle, the whole being performed during one revolution of the crankshaft.

We are informed that several of these engines have worked for six months ten hours every working day without a valve being removed for cleaning, without the piston being taken out, and without a single bearing being adjusted. This seems coming within measureable distance of the simplicity and certainty of a steam engine.

The great economy of these engines is obtained mainly from two causes. In the first place, it will be seen that unlike any other gas engine, the expansion of the ignited charge does not end when it has reached the original volume of the charge, but is continued to any desired extent, generally about twice the original volume. This continued expansion adds about a third more work for the same consumption of gas; its value is very much increased from the second main source of economy, which is the rapidity with which the expansion takes place. Other gas engines expand to original volume during one-half of a revolution, this one expands to original volume during one-eighth of a revolution, so that work is done four times as fast. When it is understood that one of the greatest sources of loss is the passage of heat through the walls of the cylinder to the water-

jacket, it will be seen how necessary it is to do the work rapidly. From this cause the expansion line of the diagram when the expansion has taken place as far as original volume will be found to be from 5-lb. to 10-lb. higher (it is generally about 45-lb.); this leaves a considerable pressure with which to continue the expansion. In this engine the terminal pressure is generally about 14-lb., which gives a quiet exhaust and a better opportunity for the gas to be thoroughly consumed during the working stroke.

In all gas engines there is a heavy initial pressure which in every other instance is transmitted to the crank-pin and main bearings. Here, however, this heavy pressure is transmitted directly to the long bearing of the vibrating link. This bearing is made the whole width of the engine, is lined with white metal, and thus takes this heavy shock without any straining and with very little friction or wear.

Taking an ordinary diagram from one of these engines, the pressure on the crank-pin and main bearings never exceeds about 35 per cent. of the maximum pressure on the piston. The work done in the cylinder during the early part of the expansion is also transmitted more gradually to the crank-pin, so there is not the jerkiness in running so commonly associated with gas engines; combining this with the ignition every revolution controlled by a wonderfully sensitive governor, the running of these engines is remarkably steady and regular. The makers assert that when everything is in first-rate order they will not vary more than from 1 to 2 per cent. between maximum and minimum loads, and that it is perfectly immaterial how suddenly changes in the working loads are made.

The "Cycle" Gas Engine consumes less Gas per brake horsepower than any other Gas Engine, and the Governor controls absolutely the Speed and the proportionate Consumption of Gas.

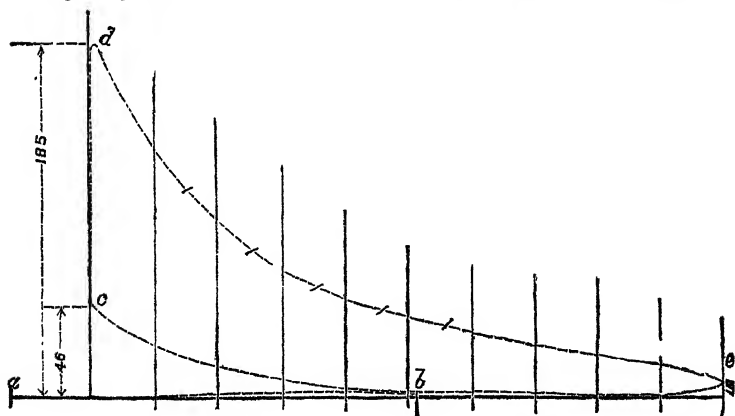
The ignited charge is expanded in these engines to about double its original volume, thus greatly increasing the power and preventing the excessive noise of the exhaust; the power is also developed four times as rapidly as in any other engine, consequently the enormous loss of heat to the water-jacket in other engines is reduced to one-fourth; for these reasons, combined with their small amount of friction, these engines are absolutely guaranteed to give a greater amount of actual brake power per cubic foot of gas than any other gas engine.

As an indication of the confidence placed in this invention, we may

remark that the makers will replace or repair any part of these engines should any damage be caused by fair wear and tear within Six Months from date of delivery.

All engines above 1-H.P. are fitted with two fly-wheels, thus ensuring equitable wear of the bearings.

The indicator diagram is an exact copy of one taken from an 8 nominal horse-power engine; *a* to *b* corresponds with the suction stroke, *b* to *c* with the compression stroke, *c*, *d*, *e* with the working (expansion) stroke, and *e* to *a* with the exhaust stroke. All other gas engines in the market only expand the ignited charge to the original volume, the working stroke being finished at *b*; they usually open the exhaust valve when there is 40-lbs. pressure in the cylinder, thus not only absolutely wasting this pressure, but also making the exhaust extremely noisy. This diagram shows that the expansion is continued until there is only 10-lbs. in the cylinder, giving with the same amount of gas 31.6 per cent. more power than can be obtained by any other engine, together with a quiet exhaust. The piston when at *a* (the end of the exhaust stroke) is as close to the end of the cylinder as is practicable, and thus drives out the whole of the burned gases from the previous working stroke. It will be thus seen that, with one single-acting piston in one cylinder, an impulse every revolution, a great gain in economy, and an entire absence of complicated parts,



are obtained. The only other engines made which have an impulse every revolution (excepting our Differential type) have the complication of a separate charging cylinder, with extra valves and passages charged with explosive gases, or have a complete duplicate engine.

There are only three valves in the engine—an exhaust valve, which is exactly similar to that commonly used in gas engines, a suction valve, which is a duplicate of the exhaust valve, and a small gas governor valve. These valves are all opened and closed quietly and directly by cams on the main shaft, without the necessity for gearing, or any complication whatever. There are no flat sliding surfaces whatever.

In proof of the simplicity of these engines, and their non-liability to get out of order, the makers can show intending purchasers engines which have been in full daily work for more than six months without requiring any adjustment of the bearings, or even cleaning the valves and piston. They do not run at excessive speeds, and can be worked at very slow speeds with equal satisfaction and economy.

On April 4th, 1887, Professor W. CAWTHORNE UNWIN, F.R.S., made an exhaustive series of tests, extending over a whole day, with the first 4-horse-power "Cycle" Gas Engine made, and below we give the concluding remarks of his Report thereon:—

"GENERAL CONCLUSIONS.

"It appears, therefore, that the Atkinson Engine works satisfactorily throughout a day's trial with regularity of speed, and without requiring attention.

"It realises an exceptional economy of gas at full power, and at least an equally exceptional economy at reduced power.

"The link work, though novel, is of a simple kind, and I see no reason why it should give trouble.

"The valve gear is particularly simple and easy to work, and it is an advantage that there is no slide valve.

"The friction of the engine is rather less than usual.

"The high piston speed without exceptionally high crank shaft speed, tends to economy in working, and cheapness of manufacture. The fact that an impulse is given in normal working at every revolution increases the steadiness of running, and facilitates the control of the engine by the governor.

"I am, Gentlemen, very truly yours,

(Signed) W. CAWTHORNE UNWIN."

"Palace Gate Mansions, Kensington, April 11th, 1887.

* * *This engine gave a brake horse-power for 22.11 cubic feet of London gas. London gas has an actual candle power of about 17, and is*

not so good as that usually supplied in the North of England and in Scotland, which often exceeds 27 candle power. This result has never been equalled by any other type of engine, and other "Cycle" engines have since been tested by ourselves, giving much better results.

Engineering says:—

"The running of these engines is remarkably steady and regular."

"There is not the jerkiness in running so commonly associated with gas engines."

"It gets rid of what has hitherto been the greatest source of trouble with gas engines."

"Seems coming within measurable distance of the simplicity and certainty of a steam engine."

The general conclusions of the Report of the "Society of Arts" Trials are, that the "Cycle" is the most economical gas engine, as the trials which were conducted under circumstances disadvantageous to the newer engine they showed that the older and better known Crossley's required 7·8 per cent. more gas per brake h.-p.; with equal-sized engines the Cycle has shown an economy of 15 to 20 per cent. The salient features of this engine which distinguishes it from all others are:—

A long suction stroke.

A short compression stroke.

A long expansion stroke.

A full length exhaust stroke.

all of which are obtained during one revolution of the crank. Hence any quantity of air and gas may be drawn or compressed to any desired extent, expanded into more than the original volume of air and gas, and finally the cylinder swept thoroughly of all products of combustion; and all these during one revolution of the engine. In engines of the "Otto" type the expansion stroke is the same length as the compression stroke, consequently the exhaust takes place at a high pressure, but the long expansion stroke of the "Cycle" engine reduces the pressure by doing further work with pressure or products of combustion that would otherwise be exhausted or wasted.

The engine is simpler than any other, consequently the wear and tear is less, and owing to the thoroughness with which the cylinder is swept of all products of combustion at every revolution it runs for a

long time without receiving any attention. A circular of a rival maker before us at this moment says:—

“All other gas engines require cleaning once a week; ours once in three weeks.”

But the makers of the “Cycle” engine say that it has been running more than six months without being touched.

This engine will work with perfect satisfaction with all the various kinds of gas in use, such as “Dowson” gasoline, petroleum, heavy oils, &c.

It has no slide, and all passages through which gas and air have to pass are large, and not liable to become obstructed by oil or products of the burnt gas. This feature ensures the ready starting of the engine.

REUNION.

CONVERSION OF MOLASSES INTO SUGAR.

The *Journal des Fabricants de Sucre* reproduces an article from the *Mouvement de l'île Maurice*, of which the following is a translation:—

Every Mauritian will now have heard of the discovery which has been made at Réunion by MM. Mazeau and Berthault, of a most simple process for extracting sugar contained in syrup or molasses.

Several chemists at Mauritius have already called the attention of planters to the large quantity of sugar contained in the molasses which they were delivering at very low prices to distillers, or to Indian merchants for export to Calcutta. We remember to have heard one of our chemists say that a central works should be started, to buy up all the molasses of the country and extract the sugar from them; there would be a colossal fortune to be made. However, he added immediately, that would be folly. The moment the planters knew the quantity of sugar contained in their molasses, they would cease to sell them.

The Indian merchants, with remarkable instinct, lost no time in profiting by what was rejected from our works. They sent them at considerable expense to India to be made into coarse sugar for the native population.

The loss thus suffered by the planters is at least 8 to 10 per cent. on their total production, and it is this loss which the inventors have succeeded in preventing. We have had a long talk with M. Berthault

during the short stay which he made in the Mauritius, and he explained to us clearly that the increase of 8 to 10 per cent. which he undertook to produce in the yield of the cane at the works, was caused entirely by the extraction of the sugar contained in the syrups and the molasses.

The planters both here and at Réunion get about 660 barrels of molasses per 1,000 tons of sugar. The density of these molasses varies between 36 and 44 degrees. Taking the average density as 40° (Mr. Berthault has tried it a hundred times) the barrel of 225 litres (49½ gallons) gives from 220 to 223 kilos (485 to 491 lbs.) of sugar; with a density of 36°, from 205 to 207 kilos (451 to 455 lbs.) Reckoning 220 kilos of sugar to 660 barrels, we have a production of 145,200 kilos (142½ tons) of sugar per million barrels, and if we estimate these sugars at Rs.7.50 per 50 kilos (1 cwt.) we have a sum of Rs.21,780. The value of the 600 barrels of molasses being Rs.3,300, we have therefore a net profit of Rs.18,480, gained by the process of Mr. Berthault.

This process of extracting sugar can be employed in two ways—one by adding the molasses to the cane juice in a fixed proportion and according to a method of which Mr. Berthault reserves the secret, or by working the molasses alone.

The first way would be much the most advantageous. The planters would only produce sugars of the first jet. All the syrups or molasses would gradually pass into the juice. Mr. Berthault has acted in this manner at Réunion on two estates, and has ascertained that the colour and the saccharine content of the products were in no way affected by the gradual admixture of syrup. But the sugars which we make in Mauritius are all of a very good colour, whilst those of Réunion scarcely ever go beyond the type No. 14. Mr. Berthault is convinced that his process will in no way injure the quality of our sugars, but he proposes to verify the fact on his next visit to Mauritius. If the result should not answer the expectation of Mr. Berthault, his process by the gradual admixture of syrup with the juice would be hopelessly condemned. At no price would our planters consent to lower the fine quality of their sugars. But there would remain then the employment of the same process for the treatment apart of syrups or molasses, and from this side the results are certain. They are those which we have given above. Each barrel of molasses at 40° will produce about 220 kilos (485 lbs.) of sugar.

In the first case, then, the planters would have the double advantage of having only sugars of the first jet and at the same time an increase of 8 to 10 % on their production. This is the result which has been obtained at Reunion in the case of crystallised sugars of types 14 to 15. In the second case, they would have a certain increase of syrup sugar amounting to 145,200 kilos per million barrels of molasses.

MONTHLY LIST OF PATENTS.

Communicated by Mr. W. P. THOMPSON, C.E., F.C.S., M.I.M.E.,
Patent Agent, 6, Lord Street, Liverpool; 6, Bank Street,
Manchester; and 323, High Holborn, London.

ENGLISH.

APPLICATIONS.

4444. J. GRASS & O. OHME, London. *The improvements in the manufacture of saccharine liquors for brewing and other similar purposes, and in the mode of their manufacture.* 14th March, 1889.

4941. P. LITWINENKS, London. *Improvements in the manufacture of sugar.*

4942. P. LITWINENKS, London. *Improvements in apparatus for use in the manufacture of sugar.* 21st March, 1889.

5155. J. ANDERTON, Birmingham. *An improved polariscope for the use of brewers, sugar manufacturers, analysts, and others.* 26th March, 1889.

ABRIDGEMENTS.

6098. GEORGE FLETCHER, of Masson Works, Litchurch, County of Derby, Engineer. *Improvements in sugar cane mills.* April 24th, 1888. Applicable to three roll mills. The two top rollers are arranged in the same horizontal plane, and the bottom roller in the same vertical plane as the first top one. By this arrangement of the rollers in the headstock, the strain between them is entirely taken by the wrought iron bolts. Another advantage is that the juice falls freely by its own gravity, and cannot be reabsorbed by the megass.

AMERICAN.

ABRIDGEMENTS.

397916. H. HILL, Chester Cross Roads, County of Geauga, Ohio, U.S.A. *Evaporator.* February 18th, 1889. A number of pans are set side by side over the arch or furnace. Each pan is connected to

the next one by hollow trunnions which allow the liquid to circulate. A circulation tube traverses from the front of each pan to the back, and there joins the said trunnions. The movable joints of the trunnions are conical, which enables the pans to be tilted without leakage.

398348. CARL RABE, of Sangerhäuser, Prussia, Germany, Assignor to the Sangerhäuser Actien-Machiner-Fabrick, and Eisengierserei Vorm, Hornung and Rabe, of same place. *Sugar cane slicing machine*. February 19th, 1889. A machine having a horizontal revolving disc set with radical cutters. Several feed hoppers are set above the said disc at such an angle that the cane which is fed longitudinally against the cutters is cut into slices of an oval form.

399100. W. WALTHER, New York. *Sugar creaming and mixing machine*. March 5th, 1889. Consists of a circular shallow cooling vessel to contain the heated sugar. Radical knives revolve with a central spindle and slice or scrape the surface of the sugar. Friction devices are provided to prevent straining, also an outer rim to obviate spilling.

399311. MAX AMS. *Evaporating apparatus*. March 12th, 1889. Four pans are shown one above the other. The first and third incline in one direction, and the second and fourth in an opposite direction. The fluid is thus caused to take a zig-zag path over the pan bottoms which are steam jacketted. A fan chamber is arranged to withdraw the vapour.

BELGIAN.

ABRIDGMENTS.

72902. M. RUDNICKI, Brussels. *Improved process for obtaining refined sugar directly from slightly coloured sugar of the second or third cast*. April 27th, 1886. The inventor claims: Instead of the usual addition of coloured sugar of the second or third cast to the raw material, the dissolution of this sugar in weak purified juice or in water, to the consistency of the concentrated juice (about 25 degrees Baumé); this concentrated juice is then steeped in lime, filtered, and boiled to small crystals, after which the granulated mass is placed in turbines furnished with moulds, in which the crystals are washed by steam until a colourless syrup begins to run out; cold air is now introduced to determine the formation of the crystals in the large quantity of cleare produced by this washing.

73001. SOCIÉTÉ ANONYME DE RAFFINAGE SPÉCIAL DES MÉLASSES,

Saint-Josse-ten-Noode. *Improved process of purifying saccharine juices, syrups, and molasses.* May 5th, 1886. The inventors claim :—

1. A method of preparing syrups or molasses in view of purification, consisting in diluting to about 4 to 8 degrees Brix, and in neutralising the alkalies or their basic combinations by adding the necessary quantity of an acid or acid salt, and after the saturation the addition of a milk of lime in quantity about $\frac{3}{1000}$ by weight of that of beetroot, treated with the diluted syrup so prepared. 2. Purification of the syrups or molasses so prepared by subjecting them to a process for abstracting the saccharine juices, noticing that, if with diffusion, the temperature must be below 75 degrees, and if with pressure, the temperature must not reach 70 degrees, and should preferably be kept about 60 degrees. 3. The purification of syrups or molasses prepared, as above shown, with the addition of about $\frac{3}{1000}$ of free lime, by mixing them with the raw juices, raising the temperature to 70 degrees for about twenty minutes, and separating off the precipitate formed by a suitable filtration.

73023. MALLIAR-LAMBLLOT ET J. MALLIAR, Brussels. *Improved method of extracting sugar from molasses and saccharine juices called dividing.* May 7th, 1886. This method consists of placing separators or dividers over the vats containing the molasses or saccharine juices, the said dividers being formed of perforated surfaces over which a parchment or other porous cover is placed, and which produces dialysis. Their effect is continuous, the only, and momentary interruption is caused when changing the dividers. Two channels are placed near the vats, one of which receives the saline water, and the other the separated juices or molasses, and leading each to a receptacle, the contents of which are kept at the temperature required for producing the best result. The heating of the vats containing the molasses and saccharine juices to be dialysed is applied from below. This heat puts the molasses in continual motion, so that the molecules are constantly brought in contact with the dividers.

73039. F. BAUDER, Brussels. *Improvements in the method of perforating loaf sugar in the manufacture.* May 8th, 1886. The inventor claims as his entire and exclusive property. 1. The process consisting in making holes in the pieces of sugar, said holes being in any form, dimension or number whatever, and also the pieces, blocks or loaves being of any dimensions. 2. The process for making these perforations of any shape by means of any machines whatsoever in

loaves, blocks or pieces of sugar. 3. Process for obtaining by means of any mould, pieces, blocks, or loaves of sugar already perforated. 4. The combination of the above for producing sugar in any shape with perforations of any desired form.

74051. S. CUISINIER, Brussels. *Improvements in a diastasic saccharine material called "cèrèalose."* July 31st, 1886. The inventor has modified in the following manner his mode of manufacturing "cèrèalose." He liquifies, boils, and dextrinates an amylaceous substance with a minimum amount of malt, raw or dry, in the manner known in the manufacture of maltose. The juice being pressed out of the residue in a filter press, the latter is concentrated, if required, in a vacuum to 20 degrees Beaumè. At this point steeped and finely crushed grain is added, and carefully mixed with the syrup. To 2 hectolitres of syrup at 20 degrees, is added a quantity of steeped and crushed grain, represented by 100 kilos. of dry grain. The temperature of the mixture, which is constantly shaken, is kept either at 40 degrees to 50 degrees with the precautions mentioned, or at 60 degrees to 62 degrees for about 48 hours. The syrup is then very readily separated from the residue in the filter presses. The residue formed of non-exhausted corn is washed at will, and is then immediately subjected to an ordinary treatment with malt, to extract a new quantity of syrup at 20 degrees Beaumè, ready to be treated as before.

74058. J. MALLIAR & MALLIAR-LAMBLLOT, Brussels. *Improvements in the process and apparatus for extracting sugar from molasses and saccharine juices.* July 31st, 1886. The dividers are plunged into the syrup in a vat, at about 35 to 45 degrees Beaumè, and at a temperature of about 40 degrees centigrade, more or less. Water heated to 40 degrees centigrade and purified, alcanised or acidulated, as may be desired, is introduced into the apparatus by means of tubes and cocks. The surrounding atmosphere should be kept at 40 degrees, by means of heating apparatus, which may also be used for heating the water. The dividing apparatuses formed of metallic cloth, covered with a sheet of vegetable parchment, may be placed either horizontally or vertically in the vats, at the end of a certain number of hours, varying from 12 to 24, the water impregnated with salt is drawn off and replaced by fresh water. After a certain number of these operations a sufficient quantity of salts will have been extracted to allow the syrup to be boiled and the sugar to be

obtained. The salted water is concentrated and used in the manufacture of manure.

74073. C. NERINCKO, Halifax. *Improvements in refrigerators for beetroot juices.* August 2nd, 1886. This apparatus consists in a cylindrical cauldron with double bottom of a size, proportional to the amount of work in the factory. This refrigerator cools the juices pressed from the beetroot, before they pass into the sieve, and with the pressed or diffused juices before they pass into the measuring vats.

74346. C. RANSON, Brussels. *Improvements in a tissue for the filtration of saccharine or other juices.* August 24th, 1886. This invention has for its object the use of cotton or other textile material covered with a woollen nap.

74453. ROTTEN, Brussels. *Improvements in crystallisers for sugar candy.* September 4th, 1886. The inventor claims:—1. Crystallisers for sugar candy, in which the sides are sloping or curved and diverge towards the base, so that vertical lines drawn from the mouth will not come in contact with the sides. 2. In the crystallisers mentioned in the first claim, concave or convex bottoms from which the coating of sugar can easily be removed.

74512. E. T. GAUTIER, Brussels. *Improvements in the application of a save-all concentrator in sugar refining.* September 11th, 1886. The inventor claims:—1. The application and exclusive use of the save-all in the form of an inverted cone, covered with a cap, in apparatus for concentrating sugar to prevent the juices from rising over and escaping during the process of concentration. 2. The application and use of all other similar apparatuses which will attain the same result whatever their shape may be.

74530. T. C. A. CARRÉ, Brussels. *Improvements in the manufacture of sugar in cubes.* September 14th, 1886. The inventor claims:—1. The manufacture of sugar directly in pieces by means of a form with ribbed partitions, by means of the ordinary processes in use in the manufacture of loaf sugar; without the use of any turbines for the compression or agglomeration of the boiled mass, by which means sugar is obtained in pieces exactly similar to loaf sugar, and of the same quality and same contexture of the molecules. 2. As a means for producing the same, the mould in which the sugar is treated as in ordinary loaf sugar forms, and consisting in a box in the form of a truncated pyramid with horizontal rows of rubbed

divisions, the distance between each, which is equal to the thickness of the blocks to be obtained, is regulated by means of grooved plates, placed against the walls of the box in the grooves of which the said divisions are held.

74622. E. HEFFTER, Brussels. *Improvements in the process of clarification and saturation of saccharine solutions, and especially beet-root juices, by means of tannin.* September 23rd, 1886. This invention has for its object a process for clarification of the saccharine solutions with the help of tannin. A process consisting in bringing the juices or solutions to a degree of concentration equal to that of the syrup; in producing in them a degree of calcareous alcalidity of at least 0.05, in cooling down to 25 to 40 degrees, and in treating under these conditions with a sufficient quantity of tannin to reduce the alcalinity to form 0.02-0.04, so as to produce a flocculent precipitate. The juice is now heated to from 80 to 95 degrees, and then the precipitate extracted.

Patentees of Inventions connected with the production, manufacture, and refining of sugar will find *The Sugar Cane* the best medium for their advertisements.

The Sugar Cane has a wide circulation among planters in all sugar producing countries, as well as among refiners, merchants, commission agents, and brokers, interested in the trade, at home and abroad.

BET BEET GROWING IN CALIFORNIA.

From the following report of the correspondent of *The New York Tribune* on this subject, it would appear that beet sugar manufacturing in California is not all plain sailing—At page 252, we give some particulars of what has been done during the past year at Watsonville, which look favourable. The subjoined extract shows the other side of the picture—Claus Spreckels, who has just returned from Washington, where he has been labouring for a bounty on beet sugar, is said to be greatly disappointed at the outlook for his beet sugar factory in Washington, Monterey county. The farmers there agreed to raise enough beets to keep the factory running throughout the year, but the result of one season's work has disgusted them with sugar-beet business. The best beets, with the highest percentage of sugar, brought about 25 cents per bushel, while the average crop throughout the Pajara valley netted the farmers only about 10 or 12 cents a bushel. The result was that only about half the number of farmers

who grew beets last year have made contracts for the coming season. One of the largest land holders near the factory refused to allow his tenants to grow sugar beets, as he declares this will enhance the price of land and he will have to pay more taxes. Spreckels would buy land and grow his own beets, but good land about Watsonville commands from \$300 to \$500 an acre. He declares that unless more interest is shown by the farmers, he will soon close the factory and transfer the machinery elsewhere. He will build no more factories unless there is enough land to be had near by to grow his own beets. It is his purpose to build the next factory in northern California, in Shasta or Tehama county, where good land can be bought for \$30 an acre.

From the telegrams "America day by day," April 20th, appears the following, respecting Claus Spreckels and the sugar market:—

The sugar markets in the United States are being watched as attentively as they are in England and Scotland. The recent advance in the price of sugar is here attributed to the fact that Mr. Spreckels has "cornered" this year's crop. If we are to believe the current gossip of the sugar market, Mr. Spreckels some months ago foresaw the shortage which has now been made manifest, and bought up all the sugar he could lay his hands on. It is now believed that he holds more sugar than the Trust itself. What with his foresight and his establishment of factories in California for the refining of beet sugar, Mr. Spreckels seems in a fair way of amassing a colossal fortune which will vie with those of the Mackays and the Vanderbilts.

NEW YORK PRICES FOR SUGAR.

From Willett, Hamlen & Co.'s Report, April 18th. 1889.

FAIR REFINING.	96o/o CENTS.	GRANU- LATED.	STAND. A.	STOCK IN FOUR PORTS.
April 18, 1889.—6 5-16c.	7½c.	8½c.	8½c.	Jan. 1, 1889— 32,254 tons.
April 19, 1888.—4 13-16.	5½c.	6½c.	6½c.	Jan. 1, 1888— 47,798 tons.
April 21, 1887.—4 9-16c.	5 3-16c.	5 11-16c.	5 5-16c.	Jan. 1, 1887—102,279 tons.
April 22, 1886.—5½c.	5 13-16c.	7-7½c.	6½-½c.	Jan. 1, 1886— 57,328 tons.
April 23, 1885.—4 9-16c.	5 5-16c.	6c.	5½c.	Jan. 1, 1885— 89,186 tons.
April 17, 1884.—5½c.	6 5-16c.	7c.	6½c.	Jan. 1, 1884— 60,900 tons.
April 19, 1883.—6 15-16c.	7½c.	8½c.	8½c.	Jan. 1, 1883— 50,297 tons.
April 20, 1882.—7½c.	8 9-32c.	9½c.	9½-½c.	Jan. 1, 1882— 43,927 tons.
April 21, 1881.—7½c.	8½c.	9 7-16c.	9-9½c.	Jan. 1, 1881— 66,999 tons.
April 15, 1880.—7½c.	8 9-16c.	9½c.	9-9½c.	Jan. 1, 1880— 63,558 tons.

ESTIMATE OF THE PRINCIPAL CANE SUGAR CROPS FOR 1888-9, WITH ACTUAL CROPS OF SIX PREVIOUS YEARS.

	1888-89.	1887-88.	1886-87.	1885-86.	1884-85.	1883-84.	1882-83.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Cuba	550,000	647,000	608,900	705,400	630,800	560,900	485,000
Porto Rico	70,000	75,000	86,000	64,000	70,000	98,600	70,000
Trinidad	65,000	60,000	69,000	49,200	65,700	59,800	54,000
Barbados	60,000	60,000	65,000	44,000	60,700	56,000	52,000
Jamaica	30,000	30,000	21,000	17,000	25,000	29,500	25,000
Antigua and St. Kitt's	25,000	26,000	25,000	25,000	20,000	23,000	16,000
Martinique	45,000	42,000	41,000	33,000	38,800	49,400	46,800
Guadeloupe	55,000	50,000	55,000	37,000	41,200	55,300	52,000
Demerara	110,000	135,000	135,000	111,800	96,000	126,000	117,000
Reunion	32,000	32,000	32,000	35,000	36,500	37,800	34,000
Mauritius	125,000	120,000	101,800	114,200	128,000	120,400	116,700
Java	330,000	380,000	363,950	365,950	374,400	311,400	283,600
British India	55,000	55,000	50,000	50,000	45,000	60,000	87,000
Brazils	220,000	320,000	260,000	186,000	269,000	359,000	218,000
Manila, Cebu, and Iloilo	230,000	170,000	180,000	186,000	203,400	122,000	211,600
Louisiana	140,000	158,000	80,900	127,900	94,500	128,400	135,300
Peru	30,000	30,000	26,000	27,000	35,000	25,000	31,000
Egypt	50,000	50,000	50,000	65,000	41,000	37,000	21,000
Sandwich Islands	125,000	100,000	95,000	96,500	76,500	63,700	51,000
Total of Cane	2,347,000	2,540,000	2,345,550	2,339,950	2,351,500	2,323,200	2,107,000
" Beet	2,725,000	2,451,900	2,733,900	2,223,600	2,546,000	2,361,000	2,147,000
Cane and Beet	5,072,000	4,991,900	5,079,450	4,563,550	4,897,500	4,684,200	4,254,000

From H. Clark & Co.'s Monthly Report, April, 1889.

IMPORTS AND EXPORTS (UNITED KINGDOM) OF RAW
AND REFINED SUGARS.

JANUARY 1ST TO MARCH 31ST, 1888-1889.

Board of Trade Returns.

IMPORTS.

RAW SUGARS.	QUANTITIES.		VALUE.	
	1888.	1889.	1888.	1889.
	Cwts.	Cwts.	£	£
Germany	554,536	1,548,213	413,326	1,072,417
Holland	56,654	93,990	38,995	62,105
Belgium	280,396	345,320	187,487	213,050
France	1,179	24,067	1,149	15,786
British West Indies & Guiana	587,056	615,195	508,235	518,999
British East Indies	130,965	56,964	66,387	30,581
China and Hong Kong .....	.....	.....	.....	.....
Mauritius	57,061	20,883	39,294	14,144
Spanish West India Islands	156,044	34,000	125,086	28,050
Brazil	1,075,273	363,487	690,378	235,874
Java	1,336,121	283,168	1,061,282	239,657
Philippine Islands	85,960	64,705	42,675	31,674
Peru	184,803	165,086	142,039	121,038
Other Countries	157,522	190,620	114,460	133,188
Total of Raw Sugars ..	4,663,570	3,805,698	3,430,793	2,716,563
Molasses	33,235	47,295	12,639	17,137
Total Sugar and Molasses .....	.....	.....	3,443,432	2,733,700
REFINED SUGARS.				
	Cwts.	Cwts.	£	£
Germany	542,060	1,089,984	480,589	959,347
Holland	282,709	374,684	265,333	342,662
Belgium	67,124	73,354	64,307	69,669
France	208,069	339,700	192,162	302,442
United States	4,673	7,565	4,392	6,460
Other Countries	86,959*	323,440*	70,421*	270,817
Total of Refined	1,191,594	2,208,727	1,077,204	1,951,397
EXPORTS.—REFINED SUGARS.				
	Cwts.	Cwts.	£	£
Sweden and Norway	14,793	23,576	12,768	17,747
Denmark	11,812	33,025	8,857	24,353
Holland	19,583	23,252	14,790	16,519
Belgium	6,846	7,024	5,289	4,632
France	1,045	3,908	776	2,739
Portugal, Azores, & Madeira	21,263	21,016	15,931	14,976
Italy	16,137	22,248	12,338	16,860
Other Countries	40,860	38,010	33,890	29,909
Total of Exports	132,339	172,059	104,639	127,735

* Entirely from Russia.

IMPORTS OF FOREIGN REFINED SUGAR.

The British Sugar Refiners' Committee furnish us with the following figures, giving the imports of foreign refined sugar for the month of March, 1889, compared with the corresponding month of the two preceding years, and the average monthly imports for the year compared with those of 1886, 1887, and 1888, distinguishing the quantities of "Lumps and Loaves" from "other sorts," and giving the separate imports from each country:—

Countries from which Sugar has been imported.	"LUMPS AND LOAVES."						"OTHER SORTS," Including Crushed Loaf, Granulated, Crystallized, &c.						TOTAL.					
	Monthly Average.			Mar.			Monthly Average.			Mar.			Monthly Average.			Mar.		
	1886	1887	1888	1889	1887	1888	1889	1886	1887	1888	1889	1886	1887	1888	1889	1886	1887	1888
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
France.....	1462	1363	1636	1885	1003	1902	2093	2688	5099	4855	3776	3669	4150	6462	6541	5661	4672	3079
Holland	3508	3780	3267	3195	4769	1634	3578	1428	2483	2675	3049	2272	4986	6263	5942	6244	7041	3742
Germany & Austria ..	990	1347	1510	2818	1253	1267	3057	6534	10463	11729	13348	11368	7624	11810	13239	18166	12646	5881
Belgium	344	592	622	969	325	1053	1343	113	508	297	268	303	457	900	849	1222	718	1294
United States	854	454	8	..	1010	23	..	5078	2804	167	126	6440	24	111	5982	3258	165	126
Russia .....	..	3	..	..	..	..	..	3412	452	1959	5379	3	3906	5886	3412	455	1959	5379
Other Countries .....	..	..	1	..	..	..	..	9	15	2	11	..	9	15	3	11	..	..
Total	7158	7530	7094	8867	8360	8879	10071	19362	21624	21604	27942	24170	26520	20163	28698	36800	32580	17449

SUGAR STATISTICS—GREAT BRITAIN.

TO APRIL 20TH, 1889 AND 1888. IN THOUSANDS OF TONS, TO THE NEAREST THOUSAND.

	STOCKS.		DELIVERIES.		IMPORTS.	
	1889.	1888.	1889.	1888	1889.	1888.
London	31 ..	57	86 ..	79	86 ..	82
Liverpool ..	75 ..	126	96 ..	83	76 ..	125
Bristol	2 ..	4	21 ..	15	21 ..	14
Clyde	43 ..	41	75 ..	65	95 ..	63
	—	—	—	—	—	—
Total ..	151	228	278	242	278	284
	—	—	—	—	—	—
	Decrease..	77	Increase..	36	Decrease..	6

SUGAR STATISTICS—UNITED STATES.

(From Willett and Hamlin's Circular.)

FOR THE FOUR PRINCIPAL PORTS. IN THOUSANDS OF TONS, TO THE NEAREST THOUSAND. FOR MARCH, 1889 AND 1888.

	STOCKS.		DELIVERIES.		IMPORTS.	
	April 1st.		In March.		In March.	
	1889.	1888.	1889.	1888.	1889.	1888.
New York	19 ..	82	71 ..	53	56 ..	71
Boston	2 ..	9	6 ..	14	6 ..	15
Philadelphia....	— ..	95	32 ..	15	32 ..	17
Baltimore .....	.. .	..	.. .	..	.. .	..
	—	—	—	—	—	—
Total	21	95	109	82	94	103
	—	—	—	—	—	—
	Decrease..	74	Increase..	27	Decrease ..	9
Total for the year			242	220	231	268

STOCKS OF SUGAR IN THE CHIEF MARKETS OF EUROPE ON THE
31ST MARCH, FOR THREE YEARS, IN THOUSANDS
OF TONS, TO THE NEAREST THOUSAND.

Great Britain.	France.	Holland.	German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1889.	TOTAL 1888.	TOTAL 1887.
151	195*	27	180*	146	22	721	857	909

*Estimate.

CONSUMPTION OF SUGAR IN EUROPE FOR THREE YEARS, ENDING
31ST MARCH, IN THOUSANDS OF TONS, TO THE
NEAREST THOUSAND.

Great Britain.	France.	Holland.	German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1889.	TOTAL 1888.	TOTAL 1887.
1285	459	39	458	233	349	2823	2620	2663

ESTIMATED CROP OF BEET ROOT SUGAR ON THE CONTINENT OF EUROPE
FOR THE PRESENT CAMPAIGN, COMPARED WITH THE ACTUAL CROP,
OF THE THREE PREVIOUS CAMPAIGNS.

(From Licht's Monthly Circular.)

	1888-89.	1887-88.	1886-87.	1885-86.
	Tons.	Tons.	Tons.	Tons.
France.....	470,000 ..	392,824 ..	485,739 ..	298,407
German Empire ..	980,000 ..	959,166 ..	1,012,968 ..	838,131
Austro-Hungary..	525,000 ..	428,616 ..	523,059 ..	377,032
Russia and Poland.	510,000 ..	441,342 ..	487,460 ..	537,820
Belgium	140,000 ..	140,742 ..	135,755 ..	93,690
Holland	45,000 ..	39,280 ..	36,098 ..	28,818
Other Countries..	55,000 ..	49,980 ..	49,127 ..	46,075
Total....	2,725,000	2,451,950	2,730,206	2,219,973

Mr. Licht's present estimate is the same all through as that given last month.

Mr. Görz's estimate for the present crop, 1888-89, is 2,569,000 tons, or 156,000 tons less than Mr. Licht puts it at.

STATE AND PROSPECTS OF THE ENGLISH SUGAR MARKET.

The month of April, as regards sugar, has been one of excitement and advancing prices. In March beet went up 3s. per cwt., in April the advance has been 5s., or 8s. per cwt. in the two months. German beet, 88% is now 22s. 6d. Great as is this rise, it is real—the result of supply and demand—and likely to continue through the summer, if not the autumn. The deficit in the Cuban crop is now estimated at 150,000 tons, and to this extent, at least, the United States will be compelled to make up its requirements from European markets during the next nine months. The Cuban crop is largely in the hands of those who are well able to hold it, as rates of interest are now unprecedentedly low; high as prices are to-day, it is quite likely that we may see them yet higher. Refined sugar has not advanced in the same proportion as raw, but this is only a matter of time.

The imports of foreign refined in March were 35,372 tons, against 17,449 tons in March, 1888. For the three months of 1889, they amounted to 110,432 tons against 59,580 tons in 1888, and 71,978 tons in 1887.

The deliveries into the United Kingdom (four principal ports) up to April 20 were 278,027 tons, against 242,017 tons for same period in 1888, and the imports 277,421 tons against 283,703 tons.

The stocks in the United Kingdom, on April 20, were 151,206 tons, or 76,425 tons less than at the same period in 1888.

The stocks at the four principal ports of the United States, on April 1, show a decrease of 74,404 tons as compared with 1888.

Present quotations for the standard qualities, as under, are:—

FLOATING.		Last Month.
Porto Rico, fair to good Refining	19/- to 21/6 against	14/6 to 15/-.
Cuba Centrifugals, 97% polarization	23/-	„ 17/-
Cuba, fair to good Refining	19/6 to 20/6	„ 14/6 to 15/-.
Java, No. 14 to 15 D.S... ..	23/9 to 24/-	„ 18/6
British West India, fair brown.. ..	18/6 to 19/-	„ 14/6 to 15/-.
Bahia, low to middling brown	14/- to 15/6	„ 11/- to 12/-.
„ Nos. 8 to 9	16/6 to 17/6	„ 13/- to 13/6.
Pernams, regular to superior Americans..	16/- to 18/-	„ 12/- to 15/-.
LANDED.		Last Month.
Madras Cane Jaggery.. ..	12/- to 13/- against	11/6
Manila Cebu and Ilo Ilo	12/- to 13/-	„ 10/6 to 11/6.
<hr/>		
Paris Loaves, f.o.b... ..	24/9 to 25/- against	20/-
Russian Crystal, c.i.f... ..	24/-	„ 18/-
Titlers	26/-	„ 22/-
Tate's Cubes.. ..	27/6	„ 23/-
Beetroot, German, 88%, c.o.b.. ..	22/6	„ 17/3

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 The writers alone are responsible for their statements.

N.B.—All communications to be addressed, and Cheques and P.O. Orders made payable to HENRY THORP, Ducie Chambers, 57, Market Street, Manchester.

For Scale of Charges for Advertisements, see page xi.

For Table of Contents, see page iii.

The second reading of the Government Sugar Convention Bill, which was provisionally fixed for the 16th ult., has been indefinitely postponed, and it is quite possible that nothing further will be done with it until next year. It is not a necessity that the Bill should be passed this session, seeing that the Convention cannot come into force before September, 1891. We cannot say we very much regret the delay, for time is on our side—many of the specious fallacies which have been uttered by opponents of the Bill will have died a natural death. The high price of sugar, which it is now almost certain will continue for many months to come, will do more in the way of educating the people as to the true state of the case than platform controversies.

The Sugar Bounties Commission held its eleventh meeting on the 28th ult. It is expected that at its next sitting, which is fixed for Saturday, 1st June, the Commission will adopt its report.

On the 14th ult., a crowded meeting was held in St. James's Hall, London, under the auspices of the London Liberal Union, to protest against the Sugar Convention. Sir W. Harcourt presided, supported by several members of Parliament. Sir W. Harcourt was for some time unable to proceed with his speech owing to prevailing opposition, and when the disturbance was at its height, a free fight took place in one of the galleries of the hall, several people being ejected. It was not until after an appeal from Mr. Causton, M.P., that the chairman was able to obtain a hearing. Mr. H. H. Fowler moved a resolution

condemning the Convention, which was carried, an amendment being lost.—At an adjoining hall a meeting was held in support of the Government proposals, Mr. W. T. Lawrence, M.P., presiding. Those attending had not obtained tickets for St. James's Hall.

A meeting of the British and Colonial Anti-bounty Association was held in London on the 30th ult., to consider how to bring before the public the actual facts concerning the effects of the Sugar Convention. Mr. Neville Lubbock, of the Colonial Company, presided. Letters were submitted from two of the largest and oldest firms of confectioners and fruit preservers in the kingdom, expressing approval of the Convention on the ground that it would lead to a more regular, larger, and cheaper supply of sugar than at present. It was determined to issue a "manifesto" on large posters for placarding London and the provinces.

At the Special Commission for examining the laws by which it is proposed to give effect to the Sugar Bounty Convention, which met on the 8th ult., it was announced that Turkey, on behalf of herself and Egypt, had signified her adhesion in principle to the Convention for the suppression of bounties.

General Sir Henry Norman arrived at Brisbane on 1st May, where he met with a very cordial reception. A large assembly, composed of the leading citizens, escorted him to Government House, where he took the oath of office; the day was observed as a public holiday.

The Session of the Legislative Council of Mauritius was opened on the 25th April by Sir J. Pope Hennessy, who, in his speech, announced a further extension of local government, Lord Knutsford having agreed to his proposal for adding two elective members to the Executive Council. The sugar crop and the financial position of the island was satisfactory. The assets of the colony were 20 lakhs of rupees (about £200,000) in excess of the liabilities.

The Governor strongly recommended the Council the granting of a subsidy for a British mail service.

The Council unanimously voted a resolution welcoming Sir J. Pope Hennessy, and expressing cordial support of his policy.

The *Deutsche Zuckerindustrie*, estimates the stock of sugar in Germany on 1st May, at about 100,000 tons less than on the 1st May, 1888; we give their figures, showing how the result is arrived at, the quantities given are in metric centners (2 cwts).

The amount of the German sugar production in April has now been published, and turns out to be, as had been expected, greater than that of April, 1888. The following is the calculation of the stocks:—

	1888-89.		1887-88.
Stocks on 1st August	1,050,283	....	1,019,868
Sugar production for the first nine months ..	9,337,990	....	9,155,690
Import for the first nine months	37,290	....	38,265
	<u>10,425,563</u>		<u>10,213,823</u>
Export for the first nine months	4,922,029	....	3,799,247
	<u>5,503,534</u>		<u>6,414,576</u>
Consumption for the first nine months	3,483,000	....	3,341,000
Stocks on 1st May	<u>2,020,534</u>	....	<u>3,073,576</u>

The deficiency in the stocks, which on the 1st April had reached 961,000 met. ctr., is thus brought up to 1,053,000 met. ctr. in round figures.

Some further details of the results of last year's working in the German sugar factories (taken mainly from the *Deutsche Zuckerindustrie*) are especially interesting in view of the large profits made.

Thus the *Droebe* factory, with a share capital of M. 150,000, has made a net profit of M. 110,039; *Hadmersleben* (share capital, M. 780,000), a net profit of M. 71,216; *Brehna* (share capital, M. 412,000), will pay 25 %. The *Berliner Tageblatt* is, however, responsible for the statement that the Brehna Company will pay on each share of the nominal value of M. 1,000 a dividend of M. 1,100, and that of *Landberg* (near Halle) a dividend of M. 1,000 on each share of the nominal value of M. 3,600.

It is reported that the *Fraustädt* factory will pay 20 %; *Mescherin*, 10 % as last year. *Vienenburg*, which has a share capital of M. 499,000, and a loan capital of M. 590,000, declares a dividend of 6½ %.

It is stated that the large Halle refinery will stop working on the 1st June, and not recommence until the beginning of the next campaign in September. At *Gommern* (Saxony) a new factory is to

be erected, with a minimum share capital of M. 500,000. A Belgian Company has bought two distilleries near Temesvar (Hungary), with the intention of converting them into two large new sugar factories.

Mr. Licht in his last monthly Circular gives his figures for the next European crop, 1889-90; in his weekly Circular, issued since, he strongly objects to the term "estimate," which is used, we presume, by a German contemporary, being applied to them. He says that his figures are by no means to be regarded as estimates of the quantity of sugar to be expected, but represent only the increased area of cultivation which might be expected, *but was not yet ascertained* (the italics are our own), and the deductions from that based upon last year's yield of beets and sugar respectively. Then, we would ask, why publish them at all at the present time? He admits that his figures are not reliable. What good purpose can be served by their publication?

Messrs. Willett & Hamlen, of New York, take a very sanguine view of the future price of sugar. They are of opinion that the price must go on advancing until beet sells at 30/- per cwt. That we may see a still further advance upon present prices during the present season is very likely, if not certain, but that we shall see prices at their present level after the new crop comes in, is more than doubtful. The high prices now ruling must check the increase in the consumption, if it does not stop it altogether. The deficit in the crops this year of Cuba, Brazil, Java, amount to a quarter of a million tons, and if these crops in 1890 should equal those of 1887, we shall have in 1890, with the probable increase in the European production, something like half a million of tons more sugar to handle, which will before 1890 is out, bring prices down to the level of 1888.

This is what Messrs. Willett & Hamlen say in their circular of May 9th:—

"At present it appears that an increase of ten per cent. in the sowings of beet acreage has been made, which under ordinary circumstances would be considered a fair increase for requirements, but under the present conditions is absurdly small, and will be found so, only too soon. Very little reliance can be placed on increased cane sugar crops until they are actually in hand. We must therefore repeat that, with the increasing consumption of the world, the critical position of supplies has not been adequately grasped as yet, and no steps worthy of consideration have yet been taken by sugar producers

to improve the sugar situation within the limits of two full seasons. With temporary reactions, such as the present in Europe, the advance must continue until beet sugar sells at about 30s., as it has formerly. We have never known a decline extending over a period of years to be followed by an advance extending only over one year. The conditions which finally change the tide upward are so strong, as in the present case, as to require at least two full seasons to be thoroughly recognized and met. Thus far we have scarcely got beyond considering the present rise a temporary affair, to be dispelled somehow very shortly, but no one appears to know just how, and the last reaction is greeted as the end, until the rise resumes its course again. Under these circumstances, the market of a single week has no significance, and the country will do well to carry a good line of refined in every reaction."

A correspondent, who has had twenty years' connection with Java sugar planters, writes to the *Economist*:—"As a rule, sugar manufactured in Java, even with the newest improvements in machinery, &c., and with a fair out-turn of crop, cannot be produced below 6½f. the picul, which is equal to about 12s. f.o.b. Add to this—freight, 2s.; insurance, 6d.; discount, loss in weight, &c., 6d.; or 15s. floating terms U.K. I ought to mention that 15s. simply covers cost of manufacture, without any allowance for depreciation of machinery or amortization of capital invested in the estate."

The impression that the New York Sugar Trust, like the Electric Sugar Refining Company, was a thing of the past, would seem to be erroneous. Messrs. Willett, Hamlen & Co., in their New York Circular of May 16th, have the following respecting it:—"There seems to be an impression in Europe that the "Sugar Trust" has come to an end, but this is not so, although various legal movements are continued against it, the latest being an application by the Receiver appointed by the Court to wind up the North River Sugar Refining Company for a receiver for the entire Trust to wind up the partnership and give him his share of the profits. The "Trust," however, seems to have no fear. When Spreckels' refinery in Philadelphia is completed and running, as it may be in August or September, it will scarcely do more—large as it is—than to cover the requirements of the constantly increasing consumption of the country."

Respecting the Sugar Ring in France, the Paris correspondent of the *Daily News* writes, under date May 17:—"The *Justice* make an energetic attack on the sugar ring, threatening it with the penalties

which the law ordains against forestallers. A fresh turn of the screw has brought the price of sugar up higher even than it was last week. M. Clémenceau's journal calls this a scandal, for which not the shadow of an explanation can be given, save that it is a forestalling operation. "Housewives fancy when they have to do without their glasses of eau sucrée, that the blame should fall on the Exhibition : the true reason is that, foreign sugar being practically excluded from France, six Paris refiners have been able to curtail the home supply and raise the price as they choose. When in Parliament any one proposes to balance the Budget with a small tax on sugar the members of this syndicate are always the first to throw difficulties in the way ; they are now draining more money out of the pockets of sugar consumers than any Government ever thought of doing. MM. Léon Say, Lebaudy, Haentjens, and their associates are absolute masters of the market by their combination, and by the practical monopoly they enjoy of the refining industry. The other day they decided after a few moments' conversation that sugar was to rise a penny more per pound ; but for French consumers only. Beyond the line of French Custom-houses there are free markets which render artificial scarcity impossible."

The *Deutsche Zuckerindustrie*, referring to the Sugar Convention Bill in the House of Commons, says:—As regards the statements made by Liberal members of the House of Commons respecting the most favoured nation clause, there is at any rate a precedent in the Convention which was concluded, under Mr. Gladstone's ministry, on the 8th November, 1864. In this the contracting states mutually agreed to put no taxes on their sugars, and in consequence France abolished the surtax of 2 francs on Belgian sugar. The German sugar did not obtain the same privilege, notwithstanding that the most favoured nation clause had been inserted in the treaty of peace at Frankfurt.

Messrs. Havemeyer & Elder, New York, have purchased, says the *Planters' Monthly*, the American Sugar Refinery, San Francisco. By this sale the business is placed upon a more secure basis, and, consequently, more advantageous to the Hawaiian planters.

In consequence of so much of our space this month being taken up with the Sugar Convention Bill, we have been obliged to postpone until our July number some interesting papers.

HYGIENE.

ON THE PRESENCE OF TIN IN CERTAIN KINDS OF SUGAR, A MEANS OF
DETECTING IT, AND THE PROBABLE INFLUENCE OF THIS SUBSTANCE
ON THE PUBLIC HEALTH.

By Dr. T. L. PHIPSON, F.C.S., London,

*Formerly of the University of Brussels, and late Assistant-Professor in
the Laboratoire de Chimie Pratique, Paris, Member of the
Society of Chemical Industry, &c.*

A large sample of sugar purchased in London, at a well-known stores, as "Demerara," was recently submitted to me for examination. It had a golden yellow colour, was rather moist, and, on dissolving in water, left a considerable amount of residue, and formed a solution that was cloudy.

Lady E . . ., who desired this sugar to be analysed, informed me that her servants objected to use it, but without giving any reason; she herself liked it on account of its intense sweetness, and had used it for about six weeks. But at the end of that time she had suffered from diarrhoea, *accompanied by pain*, which she had not experienced before in similar attacks, and she fancied the sugar may therefore have been the cause of this attack. She left off using this kind of sugar, and the ailment ceased in the course of a few days.

Such was the information given to me with the sample in question. The solution of this sugar had a golden colour, a very agreeable aromatic flavour, and a very sweet taste. I made three analyses of the sugar, and found that it contained 0.04 per cent. of oxide of tin, a considerable amount of glucose, and a large amount of ash (2.70 per cent.) rich in lime, with some oxide of iron and phosphate of lime. Tin is the principal impurity to which it is necessary to draw attention.

In June, 1881, I was requested to attend a meeting of the West India Committee, in London, after having detected a minute quantity of oxide of tin in some samples of sugar sent to me for analysis by some members of the Committee. On that occasion I was informed that chloride of tin was used in preparing certain kinds of sugar for the market, in order to give them a golden hue, which was much admired; and my opinion was asked as to the influence which the small amount of tin found in the samples analysed might have upon the health of the consumers. I had only two samples to examine, and

the quantity of tin in them was so small that I stated my belief it would exert no noxious influence if it did not go beyond that figure (0.001 per cent.), but that great caution would have to be observed. It appears, however, that since then the quantity has increased considerably, and the time has perhaps come when this process of "curing" sugar will have to be very closely looked into.

There are several means by which tin can be detected in sugar, and its amount accurately estimated, but certain precautions must be carefully observed, otherwise erroneous results will ensue. The method I follow is this: Not less than two ounces of the sample are taken, dissolved in a certain quantity of cold water, and, *without separating the residue*, the solution is rendered slightly acid by hydrochloric acid; it is then saturated with sulphuretted hydrogen. For the two ounces of sugar I take about a pint of water, and one to two drachms of hydrochloric acid. When the solution is saturated with sulphuretted hydrogen, the bottle is covered with a plate of glass, and the solution *allowed to deposit for at least forty-eight hours*. The clear liquid can be mostly decanted off, and the deposit collected upon a filter and washed. It contains sulphide of tin along with the insoluble impurities. The former is separated by washing with sulphide of ammonium, from which solution the pure sulphide of tin is precipitated by hydrochloric acid, added *just in sufficient quantity only*, and the liquid again allowed to deposit for forty-eight hours. By this means *the whole* of the sulphide of tin is collected. It is dried and transformed by calcination, with the usual precautions, into stannic oxide, which is weighed.

With regard to the action of tin compounds upon the animal economy, we must remember that by its chemical reactions oxide of tin resembles the oxides of antimony and arsenic very closely, both of which are powerful poisons. Nevertheless, Orfila compares the action of tin salts upon the tissues more to that of bichloride of mercury or corrosive sublimate. As tin salts are not used in therapeutics, we have little experience of their effects in very small doses; but chloride of tin (stannous chloride) has been long known to be a very dangerous substance. Dr. Christison, in his work on "Poisons," relates a case of voluntary poisoning by it, and Meinel (1851) refers to another case in which chloride of tin had been formed by the action of impure damp salt upon some metallic plates. The poisoning which has occurred of late years by the use of tin vessels has been attributed to lead, the tin being largely adulterated with the cheaper metal.

William Stone, in his *Toxicological Tables* (translated into French from the eleventh English edition, by Acar, Pharmacist to the Military Hospital, at Antwerp, 1853), says, under the head of "*Tin, Chloride, Hydrochlorate, or Oxide,*" that in poisonous doses these substances produced the following symptoms: "Nauseous styptic taste, constriction of the throat, vomiting, and *pain all over the abdomen*, abundant stools, pulse small, hard and frequent, convulsive movements of the face and limbs, sometimes paralysis; death generally occurs when the chloride or hydrochlorate has been taken."

Other remarks on the toxic action of tin salts are to be found in the *Annales d' Hygiène Publique*, by Poumet (1845), and Gobley (1869). In more recent times we have the experiments of Ungar and Bodländer (1887) with several compounds of tin, and among them stannous chloride and tartrate of tin and sodium. These experiments were made on frogs, rabbits, and dogs, and in all cases toxic symptoms, ending in death, ensued with large doses, whilst with very small doses, repeated for some time, the "results were like those of other metals which gradually undermine the health."

Such being the case, and in view of the enormous consumption of sugar by all classes of people, I am of opinion that the use of tin salt, or any other noxious ingredient, in curing or beautifying sugar, is a practice which should not be tolerated. Taking the above analysis as a fair average result (for the sample weighed about five pounds), it shows that any person who, like myself, consumes about four ounces of sugar per diem, would assimilate about 7-10ths of a grain of tin oxide (but probably in the shape of some organic compound or as chloride) every day if he used this particular kind of sugar. Or say that anyone took only a quarter of that amount, one ounce a day, he would absorb nearly 2-10ths of a grain of tin oxide per diem, or close upon $1\frac{1}{2}$ grains a week; and as metallic poisons have a tendency to accumulate in the liver and other organs, there is no saying how much mischief may be induced by a prolonged consumption of sugar containing such an impurity.

Of late years several noxious substances have been proposed and used in sugar-making; the principal of these are *baryta*, *strontia*, and *oxalic acid*. It will, therefore, become the duty of all chemists who devote themselves to the Public Health Analysis—that is, to the detection of impurities or adulteration in food and drugs—to search carefully for the substances mentioned, and make the results widely known. A sugar which shows to analysis as much as 98 or 99 per cent. of cane-sugar, may still contain a sufficient amount of some noxious impurity to prove highly injurious to health.

INFLUENCE OF THE LONDON CONVENTION ON THE
PRICE OF SUGAR, ESPECIALLY IN THE ENGLISH
MARKET.

From the Deutsche Zuckerindustrie.

In considering the question of the influence which the Convention agreed on in August last year would, in case of its being carried out, exercise on the prices of sugar, we have only to look to raw sugar. This forms the raw material of the refineries, and consequently the price for the refined article, as a rule, runs on parallel lines with that of the former. The margin between the two prices is accounted for by the larger quantity of raw sugar required for the production of the same weight of the refined article, and the cost of producing the latter. This margin has in the course of years constantly been decreasing, and will continue to do the same, because improvements in the working of the refineries are always being made, even though slowly. The keen competition of the refiners has also and indeed very considerably contributed to the reduction of this margin, and the latter has consequently become so small, that the least further frittering away would not allow of working at a profit. Hence the unprotected and unpremiumed English refineries cannot contend against the premiumed refined sugars of other countries, in spite of their having free choice amongst the sugars of the whole world, of which many are also premiumed. It is not possible to state accurately the amount of the premiums on refined sugar, because the yield of the very various qualities which are worked up in refining is not known. Last year we calculated it for Germany and Austro-Hungary at about 1 mark per 100 kilos of refined sugar, which, as against the just mentioned advantage possessed by the English refiner, may be somewhat reduced. However, if we take it as one mark, it is quite unnoticeable by the consumer, as it only amounts to half a pfennig per English lb.

As we have said, we have only to occupy ourselves with the price of raw sugar, and then first of all to answer the question—Will the exclusion of premiumed sugars restrict the quantity offering on the English market in such wise as to give rise to higher prices? Let us look at the countries which have not joined the Convention. France,

which in this respect must be considered first of all, has, as we have shown statistically in a preceding number, no sugar to bring into the world's market from its own beet-sugar production. The sugars which she sends to England and abroad consist of loaves and crystals, which she has to produce or to replace, for covering her own requirements, by importing colonial sugar, whether from her own or from foreign colonies. If these sugars are excluded from the English market, they will, with the aid of the premiums which they retain, push out somewhere else the supply from competing countries, for which the English market becomes free to an exactly equal extent. What will happen will only be a shifting, which will be to the disadvantage of France, in so far as she loses the market which is most favourably situated for her.

Of the other countries which have held aloof from the Convention neither Sweden, Denmark, nor the United States produce sufficient sugar to meet their own requirements. The latter country had nevertheless for a few years (1883 to 1886), in consequence of an inaccurate adjustment of the return of duty (drawback), a considerable export of refined sugar; but since the drawback was reduced in 1886, the export has steadily fallen off. In 1885 it amounted to 114,930 tons to England, in 1888 to 2,080 tons, and so is of no importance. If the proportion should again be altered, which is very improbable in face of the universal distrust which American refiners have brought on themselves by the formation of the "Trust," then the prohibition of import would only have the scarcely noticeable influence on prices, which the premiums on refined sugar are capable of exercising. Brazil has reserved the right of eventually joining the Convention. Should she not avail herself of this right (and it is open to every country to do this or not), and should she grant an appreciable premium on manufactured sugar (the interest hitherto guaranteed to the Central Factories has not had any favourable effect on the production), so that the exclusion of her sugars should be considered necessary, in this case also there would only be a diversion of supply, as the sugars pushed out from other markets by the Brazilian sugars would find their way to England.

According to these deductions then, we may return to the above question the definite answer that any exclusion of premiumed sugars which may be effected in consequence of the Convention will not alter the prices of sugar either in the English or any other market.

The second question now comes—Will not the abolition of premiums on the whole cause a rise in the price of sugar?

First of all we must make it clear to ourselves that this abolition has no power to exercise any influence on the price in the world's market at the moment when it takes place; that price will remain totally unaffected by such abolition, and therefore it cannot operate in the direction of increasing the production.

The disappearance of the premium affects only the manufacturer of the country which grants the premium, and he suffers this loss not only on the sugar which he exports, but also on that which he sells at home. In the country itself sugar becomes cheaper by the amount of the premium. But the manufacturer finds his compensation (not, it is true, at once, and hence his clinging to the premium), in the abolition of an artificial competition, which inevitably leads to over-production.

In the long run the price of every article must recoup the cost of production, and leave a moderate profit besides; if it does not, then the production becomes diminished until, in consequence of the reduced supply, the right price is again reached; if the profit is excessive, then the production and supply increase, and again depress the price.

Where premiums come in to interfere with this regular movement, it then becomes possible to sell at prices which do not even cover the cost, so that no restriction of the production takes place. If prices on the whole are remunerative, then the premiums go to increase the profit, and in like manner the tendency to over-production.

The remunerative prices of the years 1880-81, 1881-82, and 1882-83, fortified by the premiums, raised the production of beet-sugar from 1,888,000 tons in 1881-82 to 2,700,000 tons in 1884-85. Hence the ruinous decline in prices from 19s. 6d. to 18s. 6d. in the four years 1880-83, to 10s. 1½d. at the end of December, 1884.

In consequence of this decline, the production of beet-sugar has not yet reached the height to which, forced up in an unnatural manner, it had attained in 1884-85, and as in the meantime the consumption has steadily increased, it is at present inferior to the demand.

Both reason and experience lead us to the conclusion that without the premiums sugar would neither have fallen to 10s. 0d. nor risen to 22s. 0d.

THE CHANCELLOR OF THE EXCHEQUER ON THE SUGAR BOUNTIES QUESTION.

On the 21st ult. Mr. Goschen, M.P., addressed a large and crowded meeting at Sheffield, and in the course of his speech alluded to the Sugar Question as follows:—Perhaps I may be allowed to say one word on this question of dear sugar, and remember sugar now in the House of Commons has taken the place of Pigottism. The cross-examination that used to be directed against the Home Secretary and the Chief Secretary as regards the conduct of the Parnell Commission is now directed against Baron de Worms and the President of the Board of Trade as regards the Sugar Convention. So we intend, it is said, to make sugar dear. Well, there is no one connected with the sugar trade who does not know that the rise in the price of sugar which has taken place has been absolutely independent of the proposed Sugar Convention altogether. I can cite a fact which ought to carry conviction home to every man who will look at it honestly, and it is this: Sugar is sold either as it is called for delivery—for present delivery—or for future delivery. That is to say, sugar cargoes are bought payable and deliverable to-day or to-morrow, and cargoes are bought which are to arrive six months hence. Well, as the Sugar Convention only comes into operation two years hence, it would be supposed that the nearer you came to the awful time the higher would the price of sugar be. But it is a remarkable fact that

SUGAR DELIVERABLE IN OCTOBER

Or November is at this moment 25 per cent. cheaper than sugar that is to be delivered at once. A hundredweight of sugar deliverable now, I think, would cost about 22s., and a hundredweight deliverable towards the end of the year will cost about 15s. or 16s. How awfully, how supremely absurd to say that such a price—the present price of sugar—is due to an apprehension of a convention which is only to come in two years hence. But that is not all. We are charged with wishing to make sugar dearer. Well, I wish to remind you of this, that there can be a cheapness, there is a cheapness, which may so drive out competition, that being rid of this competition, the artificial cheapness will become artificial dearness. Let me illustrate this by a supposed case of two steamship companies running between the same ports, the one company heavily subsidised, and the other having no subsidy at all. The subsidised company reduces the freights. It

carries passengers and freight cheaper than it can really afford to do, and the competing unsubsidised company is unable in the end to keep up the competition. Would it be wise for those who are sending their freight by the subsidised line to say: "Continue that subsidy; keep up that subsidy, because for the moment we have cheap freights?" I believe that would be an unwise proceeding. It is to healthy competition and not to subsidised systems that we must look for real cheapness and for real plenty; and this whole system of bounties is an artificial system, which has been condemned by all political economists. We believed it to be condemned by the very men who are now charging us with attempting to raise the price of sugar, because we are endeavouring to secure the removal of those very bounties against which they have preached, and against which they themselves invited a conference of foreign representatives not many years ago. It is not before an audience such as this, nor at so late an hour such as this, that I should feel justified in arguing out the whole of this sugar business; but let me tell you it is known by everyone who chooses to inquire that the dearness of sugar now is not due to the sugar convention, or to the apprehensions connected with it, but it is due to a ring of sugar speculators in America, who have been able, by artificial means, and by their operations to raise the price of sugar. I believe that the best method to break these artificial rings down is to leave them to the operation of natural causes, the natural causes being in the direction that they are opposed to monopolies, and in the end will destroy every monopoly. Let me make this one parenthesis in my argument. I have known of many attempts to form rings, and it is an exceedingly interesting point. Attention is being drawn in some cases to the arrangements of capitalists and would-be monopolists who are endeavouring to raise the price of some of the great articles of consumption, but history tells us that these operations always break down in the end. Wherever it has been attempted it has been followed by ruin, because

NATURE ABHORS THESE MONOPOLIES,

And nature supplies substitutes when the monopoly price is driven too high. There was once a case when speculators in Russian tallow thought they had the whole world at their feet. Petroleum was discovered and the monopolists were destroyed. There was another time when it was thought, during the Russian war, that those who had hemp had the world at their feet. Jute was discovered and the

monopoly came to an end. They have tried the ring in copper, and the copper syndicate has ignominiously failed. They are trying it on here in salt. Let those who are trying it on look to these previous experiences and experiments and we shall see whether natural causes will not once more come to the rescue of the consumer against the monopolist. There is one point about the charges brought against us in connection with the sugar question to which I must call your attention. In the endeavour to point an argument against us, they say that we, the Unionist party, are neglectful of the interests of the great consuming classes. They wish to assert that we are pressed on by the interests of a few manufacturers. If there has been pressure behind us it has not been the pressure of manufacturers, but the pressure of the working classes themselves. But however that may be, the moral they wish to draw from it, the campaign they make, is not against the sugar convention. It is not in the sacred cause of political economy which in their other moments they say is now banished to the stars. Not at all. It is in order to endeavour to stir up the working classes to the belief that we, the Government and the Unionist party, are not sufficiently mindful of the interests of the working classes of the realm. Now I will not retort upon them. I believe that many of the most militant Radicals are honestly anxious for the increasing welfare of the toiling millions. But I claim that they shall give the same credit to us, and that they shall not think that, if we denounce their methods—and we do denounce their methods—that therefore we are wanting in sympathy for the weal of the classes whom they desire to serve. I would take the programme of the Unionist party, point by point, and I will prove there is scarcely an article in our creed which is not conceived as much in the interests of the working classes as of any other class of the community.

But let me point out parenthetically that our opponents in their zeal for the working classes they seem to ignore the great middle classes altogether. I do not know what has become of them in the political system of the country. You are continually hearing our opponents speaking of the artisans, but the artisans know this, that amongst them, living with them in harmony, and assisting them in carrying on their industry, there is a vast middle class whose interests must not be forgotten and cannot be relegated to oblivious indifference. But if I argue upon the question of the working classes alone I am bold to stand up before any audience of my fellow countrymen and to say that there is not one of the articles of our creed, not one of our

principles which is not conceived for the benefit of the whole body politic of the country. I must not recur to the topic with which I dealt at the earlier part of my speech. I showed then that it was one of the cardinal articles of our belief that the safety of the country was as important to every working man and artisan as to the wealthiest landowner or the wealthiest capitalist. And, again, take the expansion of this country. I wish that a book called "The Expansion of England"* could be printed in a cheap form. It might be distributed amongst the working classes of the country, and then they might see what an interest they all have in the expansion of our colonies and in the maintenance of our dominions beyond the seas.

SIR T. H. FARRER ON MR. GOSCHEN'S SPEECH ON THE SUGAR QUESTION.

The following letter from Sir T. H. Farrer, in answer to Mr. Goschen, is taken from the *Manchester Guardian*, of May 27th:—

Sir,—Whatever real liberals, economists, and financiers may now think of Mr. Goschen, he is a man of great knowledge, ability, and ingenuity, and his speech at Sheffield on Wednesday last is worth noticing. Let us see what he can say on behalf of this Convention.

1. "Abuse of Mr. John Morley." We all know the brief of the defendant who had no case. "Abuse the plaintiff's attorney," a line of defence to which Mr. Goschen's old friends regret to find that he is getting much addicted.

2. "The rise in the price of sugar is independent of the Convention." Of course it is, except in the sense that in the unintelligent apprehensions of a feverish market every coming event casts its shadow before, and that Baron de Worms' silly talk about a sugar scarcity frightened timid buyers and helped speculative sellers!

3. "That there may be a cheapness which may so drive out competition that, being rid of this competition, this artificial cheapness will become artificial scarcity." As if there was the slightest fear of this in the case of sugar! As if bounty-giving nations did not compete with one another! As if cane, and especially our cane sugar, did not hold its own. As if almost all countries, all soils, all climates, all kinds of vegetables were not daily producing more and cheaper

* *The Expansion of England*. By Professor J. R. Seeley, M.A. Crown 8vo. Published by Macmillan & Co., London. Price 4s. 6d.

sugar; and as if all these sugar producers from all parts of the world were not anxious to pour their sugars into our bosom, if we will only let them do so. Of all scares this scare about bounties destroying sugar production is the silliest.

3. "The dearness of sugar is due to a ring of speculators in America, and the best way of breaking rings down is to let them alone." Precisely so; this is what I have written about these bounties till I am sick of writing it. A New York friend of mine deeply interested in sugar tells me that the Sugar Trust in America has raised the price of sugar there, that it has caused great indignation, and that it will ultimately break down and make the fortunes of some and the ruin of many. But what is his moral?—for my friend is a staunch Free-trader. "That if they wish to make rings and trusts impossible, the Americans should do as the English do; should open their ports, and admit all sugar, wherever it comes from." In short, that they should do what Sir Stafford Northcote did for us, and what Mr. Goschen and Lord Salisbury are proposing to undo.

4. "That Mr. Gladstone's Government have preached against bounties and invited a conference about them not many years ago." Yes, and they made a mistake in so doing; and the conference failed even to meet, because Mr. Gladstone's Government took care to learn beforehand what the conditions were which would be exacted by foreign nations, and refused *à priori* to accept any proposal for countervailing duties. And, unless my recollection fails me, if they once invited a conference, they at other times refused to do so, knowing the false position in which they would be placed by so doing. They declined to go, as Baron de Worms has done, cap in hand to all the Chancellors of the Exchequer in Europe, begging them not to send us cheap sugar, and offering them humiliating and suicidal conditions on our part in order to induce them not to send it. The present Government, far from following the example of their predecessors, have failed to profit by its warnings. They have rushed into the pit where Mr. Gladstone's Government recoiled at the brink. Let us hear no more of such *tu quoques*.

And this is all such a clever man as Mr. Goschen has to say for the Convention. Surely, when a cause is so defended by its ablest advocate, it is in a bad way.—Yours, &c.,

T. H. FARRER.

Abinger Hall, May 24th, 1889.

THE SUGAR CONVENTION AND THE MOST FAVOURED NATION CLAUSE.

Sir T. H. Farrer has written another and longer letter on the Sugar Convention Question, which, although bearing an earlier date than the letter in reply to Mr. Goschen, has appeared later. In it he enlarges on the difficulties placed in the way of carrying out the articles of the Convention by our most favoured nation Treaties,—difficulties which we do not doubt that the Government will be able to meet when the question comes up again in the House of Commons.

Sir T. H. Farrer says in one part of this letter, “everybody knows that those who, like myself, are attacking the Sugar Convention do so, not because it tries to put an end to bounties, but because we think that the particular methods adopted for that purpose in the Convention are fatal to the best interests of the country.”

If it were not that Sir T. H. Farrer has over and over again said that whilst bounties were bad for the countries giving them, they were good for us who buy bounty-fed sugar, one might be tempted to ask him, seeing that he was for so many years intimately connected with the Board of Trade, and has the subject so thoroughly at his fingers’ ends, what measures he would propose with the view to putting an end to bounties?

This second letter, like the first, is addressed to the *Manchester Guardian*, and is as follows:—

Sir,—Will you allow me to correct and add to my former letters, to which you have referred, on this point? The subject is one of great importance and extends far beyond the sugar question.

I was wrong in quoting the return of 1879 as the last return of most favoured nation treaties. There is a later return published in 1888—No. C 5,436. The number of countries with which we had such treaties in 1879 was 40; this number according to the later return is 50. They are as follow:—Africa (Congo), Argentine Confederation, Austria, Belgium, Bolivia, Borneo, Chili, China, Colombia, Corea, Costa Rica, Denmark, Dominican Republic, Egypt, Ecuador, France, Germany, Greece, Italy, Japan, Siberia, Madagascar, Mexico, Montenegro, Morocco, Muscat, Netherlands, Paraguay, Persia, Peru, Portugal, Roumania, Russia, Salvador, Samoa, Sandwich Islands, Servia, Siam, South African Republic, Spain, Sweden and Norway, Switzerland, Tonga, Tunis, Turkey, United States, Uruguay, Vene-

zuela, Zanzibar. It has been the constant policy of our Government to extend the important agreement to as many nations as possible. Of the above-named countries it is difficult to say how many are, or rather how many are not or may not be, producers of sugar; for the sugar cane, beet, sorghum, or other sugar-producing vegetables are grown in almost all soils and climates. Austria, Belgium, France, Germany, the Netherlands, Russia, and the United States are countries where systems of taxation and drawback involve a bounty on export; whilst of these Germany, the Netherlands, and Russia are the only countries who have finally adhered to the Convention and are absolutely bound by its seventh clause not to plead a most favoured nation treaty against a boycott. France has not even signed, and will not sign unless the United States sign, which they will not do; and Austria and Belgium refuse to be bound unless France is bound. I should not think it necessary to repeat this if it were not that Baron de Worms has constantly made, and continues to repeat, the misleading assertion that these countries have signed the Convention and will be bound by its provisions. How many of the rest of the fifty countries above enumerated have or may have systems of taxation and drawback similar to those of Europe and the United States we cannot tell; but it is obvious that by promising to boycott all sugar-producing countries which give a bounty on the export or manufacture of sugar we are committing ourselves to an uncertain but possible obligation to break our treaties with half the world by suicidally rejecting their sugar.

And now let me refer specially to the case of the United States, which really raises one of the most important of the many points raised by this Convention, a point which extends far beyond sugar, and may prove even more important than the free supply of that important article.

It will be remembered that one of the charges against the Convention was that it might bind us to boycott sugar from the United States, and thus break our most favoured nation treaty with that important country and expose us to retaliation at their hands, with all its fatal consequences. The Ministerial answer to this charge is so remarkable that I will give it at length. On Friday the 10th May Sir W. Harcourt put a question challenging the Government on the subject of the breach of the most favoured nation clause, and Sir M. Hicks-Beach, as reported in the *Times*, made the following reply:—

Sir M. HICKS-BEACH: It rests rather with the Foreign Office than with the Board of Trade to give an authoritative interpretation of our treaty engagements; but as the right hon. gentleman desires my opinion I shall be happy to give it. His question, though apparently general, is really limited to the case of our treaty with the United States, for I think all other nations at all likely to send us sugar are either in some way parties to the Convention, or do not possess the claim which he quotes in their treaties with us. In the case of the United States, I would refer the right hon. gentleman to the correspondence which took place in 1884 between Lord Granville and the United States, and which is printed in Commercial Paper No. 4 of 1885. He will find that Lord Granville then complained that tax treaties made or about to be made by the United States with the Sandwich Islands and some South American States placed the latter countries in a more favourable position in the United States market than our West Indian colonies, and asked that this might be remedied by extending the most favoured nation clause of our treaty with the United States to the West Indian colonies. The United States Government declined to do this, offering to consider a reciprocity treaty to secure special favours to our West Indian colonies, but saying—and this is the important point—“that the most favoured nation clause in the treaty of 1815 has not authorised and could not authorise Great Britain to ask for the products or shipping of the United Kingdom” (or of her West Indian colonies if extended to them) “favours identical with or equivalent to those which Spanish, American, and West Indian colonial products and shipping may receive in the ports of the United States by reason of special reciprocity treaties.” In my opinion the United States would be absolutely barred by the interpretation they have thus themselves placed on the most favoured nation clause, and by the arrangements they have made with other countries in pursuance of this interpretation, from pleading the most favoured nation clause in bar of the operation of the Sugar Convention as against themselves. I am rather surprised that the right hon. gentleman should apparently be ignorant of the correspondence I have quoted, which took place while he was Home Secretary; but perhaps he has forgotten it, as it appears from his speech the other day that he must have forgotten that the Government of which he was then a member negotiated with foreign countries in order to put an end to the very sugar bounties which he now asserts are beneficial to this country.

And on the following Monday, the 13th May, when challenged by a speech on the same point from Lord Granville, in which the facts and merits of the case are clearly and admirably stated, Lord Salisbury made the following reply:—

The Marquis of Salisbury: In answer to the question of the noble Earl, I may say that I quite agree with the views of Sir M. Hicks-Beach. It is a question of what lawyers would term estoppel. The United States Government are estopped by their own statements from making use of the argument which was hypothetically put into their mouths by the noble Earl. Nothing would give me greater pain than to be obliged to throw over the language used by the noble Earl in the despatch he has referred to. But the Americans are far too high-minded to try to escape from their own statements, from declarations by which they are bound, by citing against us subsequent statements from our own side. I am speaking from memory, as I did not receive the noble Lord's notice in time to enable me to fortify my recollection, but if I remember rightly there was a treaty signed by the American Government in 1886 with the Government of Hawaii—it is a small country, but that makes no difference,—in which the doctrine is absolutely laid down that the most favoured nation clause is not to be interpreted as operating where there is a difference in the conditions under which reciprocity is demanded. I do not, therefore, suppose it is likely that the Americans would attempt to pass over their own deliberate and repeated statement, but perhaps, though I have not the least desire to complain of the question of the noble Earl, I may be allowed to say that it belongs to what has been called the science of hypothetics. There is no ground for believing that the Americans would have the temptation or the desire to make such a plea as that which he supposes. In the first place, the Americans have not dissented or shown any sign of dissent from the Convention, and we have no ground for saying that before it is ratified, towards the end of next year, they may not have adhered to it. But even if they do not adhere to it, their law contains, in the most clear and categorical terms, a prohibition of any bounty, and therefore we have no ground whatever for believing that they would ever come within the purview of the provisions which the noble Earl says would be interpreted by the language of this despatch in their favour. When the case arises, if it ever does arise, which I do not believe, I shall be prepared to join issue with the noble Earl upon the legal question; but I maintain that the legal question is now so hypotheti-

cal that it is not useful and it is not desirable to carry the discussion any further.

It is a little strange that Sir M. Hicks-Beach should have joined in the hackneyed retort of the anti-sugar bounty agitators that Mr. Gladstone's Government wished to put an end to bounties, and are consequently estopped from opposing the Convention; when everybody knows that those who, like myself, are attacking the Sugar Convention do so, not because it tries to put an end to bounties, but because we think that the particular methods adopted for that purpose in the Convention are fatal to the best interests of the country. It is true, we think, that bounties, on the whole, do us more good than harm, and that it is therefore the more suicidal on our part to abandon all our most cherished principles in order to enable Germany and others to put an end to them. But if Germany chooses to put an end to them of her own record, we should, if she does it for the sake of her revenue, accept the result with equanimity, and if she does it as an approach to Free Trade, we should hail it with satisfaction.

Passing by this, let us see what Lord Salisbury and Sir M. Hicks-Beach say in answer to the charge of probable breach of treaty with the United States. First of all, Lord Salisbury says that the question belongs to the "science of hypothetics," for that the Americans have shown no sign of dissent from the Convention, and that they may probably adhere to it before it is ratified. Now there is not a shadow of ground for this assertion in the blue-books. The Americans have from the first resolutely asserted their intention to remain independent, and there is no more chance of their submitting their system of taxation and their processes of manufacture to the supervision of Baron de Worms's international junta than of their submitting to other European complications which they irreverently call "Old World worries." Then Lord Salisbury says that their law contains a positive prohibition of any bounty, and that they therefore will never give a bounty. I should like to know where this prohibition is to be found, or, if it exists, how it is to be carried into effect. I know that Mr. Phelps stated (No. 228 of Comm. 15) that there was no legal bounty, and that the rate of drawback was not excessive. But I know that he also stated that bounties were a matter for Congress. I know that measures for giving a certain and intentional bounty on sugar were introduced last year into their Legislature by the Protectionist party now in the ascendant (see Comm. 15 of 1888, Nos. 100, 258; *Daily News*, 23rd January, 1889). I know, moreover, that our

Minister at Washington asserted and reasserted that their present drawback does operate as a bounty (Comm. 15, 1888, Nos. 20, 141, 293); and that France joins in the assertion (*ibid.* 405). I know, too, that the system of taxing the raw material and giving a drawback on exportation which the United States, in common with other nations, pursue, is one in which there can scarcely fail to be a bounty on some of the sugar exported. The amount of the drawback is founded on a calculation on the average quantity of sugar produced by a given quantity of raw material; and as some raw material produces more and some less sugar, according to the comparative excellence of the growth and manufacture, there can scarcely fail to be a bounty on the product of the most successful process. That this was the opinion of the Convention is clear, for it was for this reason that they introduced Articles II. and III., which oblige all nations which tax sugar to manufacture and refine it in bond; and it was for this reason that they sternly refused to Belgium what she struggled for to the last—viz., the liberty of manufacturing otherwise than in bond, though she offered the strongest guarantees against a bounty. Had they dared to do so, they would probably have used similar language to the United States; and when we are at the mercy of Germany and Russia, what is to prevent them from requiring us to treat the United States as they have already treated Belgium, and to assert that a bounty given by them can only be avoided by manufacturing and refining in bond? So much for Lord Salisbury's accuracy, and so much for his allegation of the impossibility of a case arising for complaint of a breach of treaty by the United States.

But by far the most important part of the answers of Sir Michael Hicks-Beach and Lord Salisbury above quoted is that which relates to the reply which, they say, they are prepared to make to the United States if any such complaint of breach of treaty is made—viz., that the United States have themselves by their action in 1884 estopped themselves from pleading the most favoured nation clause. Let me shortly recall the facts of the negotiations of 1884. The West Indian colonies, who depended largely on the United States market for the sale of their sugar, were in fear of being thrust out of that market by rivals to whom the United States were, by means of reciprocity treaties, offering specially favourable terms. Their case was therefore a very hard one, and our Government was most anxious to help them. The United States offered a reciprocity treaty to the West Indies, giving them great advantages. But to this treaty there

were two objections—first, that it would create a special commercial tie between the United States and the West Indian colonies which did not extend to the United Kingdom and to other parts of the British Empire; and, secondly, that under the special terms proposed by the United States it would constitute a breach of most favoured nation treaties under which England was entitled in the ports of the United States, and other nations were entitled in all ports of the British Empire, to the privileges accorded in those ports to the flag and goods of the most favoured nation. The United States argued that the most favoured nation treaties were conditional, and insisted that the privileges they proposed to give and to receive should be confined to the West Indies and themselves. Lord Granville refused to accept the treaty with this reservation, and maintained the position that the most favoured nation clause was unconditional and inconsistent with the proposed treaty. It was on this ground, after much and anxious consultation between the Foreign Office, the Colonial Office, and the Board of Trade (which I well remember, for I took part in it), that our Government, with much regret, refused the proffered treaty. It was felt that to adopt the American view of the most favoured nation clause would be to enable Protectionist nations, by interposing arbitrary conditions of reciprocity, to whittle it away altogether, and thus to deprive England of the benefit of this charter of her commerce. It would, to take one of Lord Granville's illustrations, enable the United States to reduce their duties on French silks and cottons in consideration of a reduction of the French duties on American corn, and at the same time, in spite of our most favoured nation treaty, to refuse to England a similar reduction unless she gave the States something equivalent to the French reduction on American corn. Or, to take another of Lord Granville's illustrations, if there was a most favoured treaty between Great Britain and the United States, and Great Britain were to reduce the duty on Turkish tobacco in consideration of an agreement with Turkey reducing the Turkish light dues, the United States would not have a right to claim a reduction on United States tobacco unless they gave up something equivalent to the Turkish light dues. "It is obvious," as Lord Granville says, "that with such an addition the most favoured nation clause loses its value and becomes a fruitful cause of dispute." And he goes on as follows:—

"The interpretation of the most favoured nation clause involved in the United States proposals is that concessions granted conditionally

and for a consideration cannot be claimed under it. From this interpretation Her Majesty's Government entirely and emphatically dissent. The most favoured nation clause has now become the most valuable part of the system of commercial treaties, and exists between nearly all the nations of the earth. It leads more than any other stipulation to simplicity of tariffs and to ever-increased freedom of trade; while the system now proposed would lead countries to seek exclusive markets, and would thus fetter instead of liberating trade. It is, moreover [he proceeds], obvious that the interpretation now put forward would nullify the most favoured nation clause, for any country, say France, though bound by the most favoured nation clause in her treaty with Belgium, might make treaties with any other country involving reductions of duty on both sides, and, by the mere insertion of a statement that these reductions were granted reciprocally and for a consideration, might yet refuse to grant them to Belgium unless the latter granted what France might consider an equivalent. Such a system would press most hardly on those countries which had already reformed their tariffs and had no equivalent concessions to offer, and therefore Great Britain, which has reformed her tariff, is most deeply interested in resisting it."

To this argument of Lord Granville's the United States seem to have made no reply, and the matter dropped. Lord Granville lost his treaty, but remained master of the argument. Under these circumstances Lord Salisbury proposes to reply to the Americans, when they complain of the boycott, that they have estopped themselves from doing so by their arguments in the foregoing affair. In fact he adopts their position and abandons Lord Granville's. Now I do not care to argue at length whether the Americans have not two or three good rejoinders. It is enough to call attention to the obvious one pointed out by Lord Herschell and Sir W. Harcourt—viz., that it was England who refused the United States treaty, that it is England who is boycotting United States' sugar, that consequently it is England rather than the United States, who is bound by her previous action and opinion, and that it does not lie in her mouth to repudiate the construction of the most favoured nation clause which she has so strongly insisted on.

There are other rejoinders, to which I have referred in a former letter. What I wish now to call attention to is the levity with which in defence of their action under this ill-advised Convention, the Gov-

ernment are ready to abandon the sound construction of the most favoured nation clause insisted on by Lord Granville, and by their own action and admission to give to foreign Protectionist nations the power of depriving this charter of our commerce of all its value. Anyone who will read carefully Lord Granville's despatch No. 18, C. 4,340, of 1885, cannot fail to see the immense importance to this country of that clause if taken in its plain and literal meaning, what sacrifices Mr. Gladstone's Government made in order to maintain it, and how suicidal it would be on the part of England to adopt the American construction of it, and to encourage foreign nations to break it down and whittle it away. Yet this is what Lord Salisbury and Sir M. Hicks-Beach are ready to do in order to defend a Convention which can in itself do nothing but harm to this country. Even what they have already said on this subject may produce much mischief in future international controversies, and may lead to difficulties in maintaining Lord Granville's sound position. It is certainly most desirable that there should be no occasion for future apologies from the Government of this fatal nature. For the sake of trade, for the credit of the Government, and with a view to the future policy of the country, let this unhappy Convention, the parent of innumerable confusions, be killed, buried, and put out of the way as soon as possible.

Yours, &c.,

T. H. FARRER.

Abinger Hall, 23rd May, 1889.

FLORIDA.

According to the "Times-Democrat," the newly erected sugar factory of St. Cloud at Kissimmee, in Florida, has obtained very satisfactory results. From 8,800 tons of cane, 1,500,000 lbs. of dry sugar, or 170 lbs. per ton of cane, were obtained; a result such as can be shown by only three out of the thousand sugar factories of Louisiana. When machinery for draining the grounds has been erected, it is believed, judging by this very promising beginning, that a further important extension of the cane cultivation and sugar industry in Florida will be possible.

THE OTHER SIDE OF THE QUESTION.

Sir William Harcourt in his speech at Manchester, on the 22nd ult., after saying that sugar was sold in this country to the amount of thirty millions sterling, is reported to have made the following statement:—"If you buy £30,000,000 worth of sugar from abroad, "how do you pay for it? You do not pay for it in gold. It is "paid for by the manufactures of the country, and if you strike off "a million from that consumption, you strike off so much off the "fund from which the wages are paid to the labouring classes of this "country."

Mr. G. Morris, in a letter to the *Manchester Guardian*, dated May 23rd, gives some interesting and suggestive figures, showing our exports of cotton goods to Germany, and to certain named cane growing countries in 1883—the year preceding the great fall in the price of sugar—and in 1887; also the value of the imports of sugar from the same countries in these two years—showing that the exports to Germany, whence we draw our largest supply of beet sugar, have *diminished* in 1887. The following is the letter in question:—

SUGAR AND BOUNTIES.

Sir,—So much has been said and written about the great gain which this country has derived from the sugar bounties that it seems to me to be worth while looking into the question whether some great loss on the other hand has been sustained or not. We in Lancashire have suffered particularly in this respect because the producers of cane sugar are amongst our best customers for prints, white shirtings, dyed drills, &c., so that the statement so often made that Baron de Worms wants to do away with these bounties in order to protect a few thousand sugar refiners in London and Bristol is hardly correct, for the bounty-fed sugar being able to undersell the cane sugar, our imports of the latter have consequently diminished from cane-growing countries, and so have our exports of cotton goods to them; but our exports of cotton goods to beet sugar countries have not increased, although the import of sugar has; indeed they have diminished, as the following figures show:—

Beet Sugar Imports from Germany.

1883.—Refined and unrefined . . . £7,100,000 in value.

1887.—Refined and unrefined . . . 6,700,000 in value.

Prices much lower in 1887 than in 1883, but quantity 50 per cent. larger, of which refined were:—

1883	£782,000 in value.
1887	2,205,000 in value.

Exports to Germany.

	£	£
1883.—Cotton goods by the yard ..	797,000	
1883.—Cotton goods at value	642,000	
	<hr/>	1,439,000
1887.—Cotton goods by the yard..	626,000	
1887.—Cotton goods at value	583,000	
	<hr/>	1,209,000
1883.—Cotton yarn	value 2,104,003	
1887.—Cotton yarn	value 1,704,000	

Total Imports of Sugar in 1887.

Beetroot, refined...	5,469,000
Beetroot, unrefined	5,378,000
	<hr/>
	£10,847,000
Cane, sugar..	5,575,000

Grand Total

£16,422,000

Imports from British West Indies.

1883.—Cane sugar	value £1,718,000
1887.—Cane sugar	value 494,000

Exports to British West Indies.

1883.—Cotton goods	value £552,000
1887.—Cotton goods	value 486,000

Imports from Java.

1883.—Cane sugar	value £3,879,000
1887.—Cane sugar	value 2,085,000

Exports to Java.

1883.—Cotton goods	value £1,474,000
1887.—Cotton goods	value 963,000

Imports from Philippines.

1883.—Cane sugar	value £749,000
1887.—Cane sugar	value 210,000

Exports to Philippines.

1883.—Cotton goods	value £706,000
1887.—Cotton goods	value 387,000

Imports from Mauritius.

1883.—Cane sugar	value £310,000
1887.—Cane sugar	value 57,000

Exports to Mauritius.

1883.—Cotton goods	value	£117,000
1887.—Cotton goods	value	54,000

These markets are just selected because cause and effect can be clearly traced in them, and they also show equal decreases in exports of machinery and other things, which cannot be given. As I wish to put the case as briefly as possible, India, Brazil, &c., are not put down, although very important, as they are mixed up with coffee, cotton, &c. 1883 was the year previous to the great collapse in sugar prices; in 1884 German beet sugar was selling at 10s. per cwt., and sometimes under, now it is 22s. per cwt. Germany is taken as the example because she is the largest beet sugar exporting country now. The estimate I make is a total decrease in exports of cotton goods of about £3,000,000, of which fully one-half can be set down for labour, so that estimating the average wages at £1 per week, there are about 30,000 persons who for the last five years have been deprived of wages to this amount annually, or who are competing in something else at reduced rates.

The conclusion seems very clear that Lancashire has lost pecuniarily much more than she has gained by excessively cheap sugar. As to the country as a whole it may be more difficult to say if it has gained by bounty beet sugar pecuniarily, although it could possibly be proved that so much more has to be used owing to its less sweetening power, that the actual outlay would be much the same as it was when cane sugar was 1½d. per lb., instead of 2½d. per lb.; the waste that has undoubtedly occurred through excessive cheapness must also be very great; then there is the loss of labour and wages in sugar refining, which must be taken into account, although it is not the only loss.

Finally, there is some good news from the cane sugar markets. "Goods are scarce, and good prices would to-day be paid," one report says, which may tend to relieve the minds of those who are anxious for fresh business, as in consequence of the present higher prices for cane sugar orders have been placed and more are coming, which will help to keep the 28,144 looms which are now standing idle or working short time only more fully employed.—Trusting this may be speedily realised for the benefit of all, I am, &c.,

G. MORRIS.

Manchester, May 23, 1889.

THE SUGAR CONVENTION BILL.

MEETING IN THE EAST END OF LONDON. SPEECH BY MR.
RITCHIE, M.P.

DISORDERLY PROCEEDINGS.

A public meeting, called by the British and Colonial Anti-Bounty Association, was held on the 24th ult. at the Vestry Hall, Cable Street, St. George's-in-the-East, to support the Sugar Convention Bill of the Government. Admission was both free and open, and, in spite of the great heat, there was a very large attendance, the spacious hall being quite filled—filled, too, as it seemed, with working men, who manifested an intelligent interest in the measure before them, though they appeared by no means unanimous as to its merits. The chair was taken by Mr. David Martineau, who was supported by the Right Hon. C. T. Raikes, M.P.

The Chairman explained that, though a strong Liberal, he presided at the meeting, where the chief speaker was to be a gentleman opposed to him on political questions, because he was of opinion that the matter they had met to discuss should not be regarded as a political one, or be used as a political weapon, as he was sorry to say it was being used in some places. Few persons in the House of Commons knew nearly so much about the Sugar Question as Mr. Ritchie, and they were glad to welcome and listen to him. He begged to move:—

“That this meeting recognises with satisfaction that after many years of negotiation on sugar bounties by both Liberal and Conservative Governments, the recent conference of the principal Powers of Europe, met to settle this question on the basis of international free trade, has resulted in a convention which will abolish bounties: and this meeting strongly urges her Majesty's Government to take all necessary steps to carry the Bill through Parliament.”

Mr. Keiller seconded the amendment without comment.

At this point a gentleman in the audience sought to move an amendment, but was advised, amid some disorder, to defer it to a later period, the Chairman observing that anyone who differed from those on the platform would have the fullest opportunity of being heard.

Mr. RITCHIE, M.P., who was received with loud cheering, and almost equally loud hissing, said he appeared there less as a member of Her

Majesty's Government than as a member for St. George's-in-the-East, desirous of consulting with his constituents on a matter of the greatest possible importance to them. He accepted without the smallest qualification the doctrines which had been laid down by the chairman on the subject of Free Trade. He admitted that if the proposals which the Government had made were not to be supported upon thoroughly sound Free Trade principles, they were not standing on a firm foundation. And he would even go further than that, and say if it could be shown that the action which the Government propose to take was an action which was likely to increase the price of sugar, that action stood on a foundation which was not firm, and could not be supported. The sugar industry, which formerly flourished so greatly in St. George's-in-the-East, was now almost entirely extinct. If it could be proved that that was due to Free Trade laws, then, however much he would regret the extinction of the trade, he would say that it was inevitable, and that on the ground of the benefit to the consumer the country which could manufacture the article most cheaply should be allowed to manufacture it, though the result to our manufacturers might be grievous. But to a large extent the misfortune that had overtaken the sugar industry in this country was not owing to the action of Free Trade principles, but to one of the most outrageous attacks on those principles that was ever perpetrated by anyone. One object of Free Trade was to promote the free circulation of commodities, but the effect of the sugar bounties had been to prevent the free circulation of sugar, and therefore, instead of having the result of cheapening the article, the ultimate result was to make it dearer. The real question they had to ask themselves was whether bounties were good or bad. If they were good, let them do all they could to encourage them. Some people were now arguing as if bounties were good things. They said that they cheapened the article which was bounty-fed, and therefore were good to the consumer. But if they asked those persons whether they approved the bounties on Free Trade principles they were forced to admit that they could not. All English Governments for many years past had been striving to put an end to bounties, and therefore, in the opinion of all those Governments bounties had been bad.

At this point the proceedings, which had been gradually growing more noisy, were entirely interrupted for some minutes.

They did not suppose, Mr. Ritchie proceeded, that foreign Govern-

ments were giving bounties with the object of giving the English consumer cheaper sugar ; they did it for the purpose of driving our manufacturers out of the field ; and when our producers were once driven out of the market, and the foreigner had no competition to meet, of course the bounty would be withdrawn, and the price would ultimately rise. No man had used stronger language in condemnation of bounties than Mr. Gladstone, who had repeatedly said that their abolition would be to the interests of the consumer. He would remind his hearers that while in 1884 816,000 tons of sugar were refined in Great Britain, in 1888 that amount had fallen to 739,000 tons. Thus, while the increase in the consumption of sugar in England during that time had been 5 per cent., the amount refined in this country had decreased 10 per cent., and our exports of sugar had decreased by 50 per cent.

The right hon. gentleman was proceeding to deal with the question as it affected the colonies when the disturbance came to a head, and Mr. Ritchie was entirely unable to proceed. For some minutes he maintained his position, essaying from time to time to obtain an hearing, but at length he gave up the task, and sat down. The efforts of the chairman to restore quiet were quite ineffectual, and though a gentleman in the hall—opposed, as he declared, to Mr. Ritchie in politics, and not agreeing with him on the bounties question—made an earnest appeal for a fair hearing, the right hon. gentleman met with a renewed shower of howls when he again rose. After another interval, during which he sought to speak, he and the chairman consulted, amid noisy expressions of delight from the rougher portion of the audience, and at length Mr. Ritchie put on his hat, walked off the platform, and left the building with some of his supporters, amid a storm of groaning, amid which could occasionally be distinguished references to “Pigott.” The opponents of the bounty system cheered in response. But after this outburst there was comparative quiet while the chairman, who had not accompanied Mr. Ritchie in his retreat, expressed his extreme disappointment at the action of the audience. He said he had been warned that if the meeting was an open one, men would attend simply to make a disturbance. He did not at the time believe that the men of St. George’s-in-the-East were so devoid of sense, but he had discovered his mistake. There was an amendment : would the meeting hear it ? This the meeting certainly would not do, judging from the uproar the question caused. Mr

Jacobs, who had sought to submit an amendment at an earlier stage, went to the platform and held possession of it for some time, as Mr. Ritchie had done, but he in turn was so screamed at by the anti-bounty men that he also had to give way. Before doing so, however, he said a few words, which were taken to convey that he moved an amendment, though what its terms were could only be conjectured. A working-man, with a voice which could almost be heard above the din, took the opportunity to protest against the refusal of the meeting to hear the speakers, and then Mr. Lyons, a Socialist, who was airily attired in his shirt sleeves, denounced capitalists and the Government in a speech of some minutes. Next, the amendment was put to the meeting, and declared by Mr. Lyons to have been passed. It seemed as if this was the case, many of Mr. Ritchie's supporters having left the room. The chairman, however, intimated in dumb show that he at least did not think the amendment carried. Nothing more was done, except that a workman on the platform and one below began to indulge in personalities, which lead to the man on the floor seizing a heavy inkstand from the reporters' table, and trying to throw it at the platform man. His arm was arrested, but as there seemed every likelihood of a disturbance the police were sent for, and the meeting closed in the utmost disorder.

MEETING OF FRUIT-GROWERS AND JAM MANUFACTURERS IN KENT ON THE SUGAR CONVENTION.

A meeting entirely composed of jam makers and fruit growers was held at Swanley Junction, near Dartford, Kent, on the 11th ult., under the presidency of Councillor A. T. Waring. Amongst those present were Professor Cheshire, Messrs. T. Wood, W. T. Wood, H. Wood, John Wood, and E. Pink (jam manufacturers), Albert Bath, E. Emerson, E. Vinson, F. Goodyear, P. Blundel, Alfred Wallis, James Allen, and others.

The Chairman said for the past few years sugar had been very cheap, and now that legislation in respect to it was threatened, as sensible men they must see how it affected the makers of preserves, and through that industry the cultivation of fruit. A far greater quantity of jam was now sold than there used to be when sugar was dear; indeed, the grocers told them that they now sold forty jars of jam to one jar of jam in days gone by. Supposing the price of sugar

went up, and the price of jam with it, the labouring population would cease to a great extent to buy it, and therefore the very large market for their jam would be lost to them. As he had already said, this was a very important question for their consideration. He had received a letter from Sir William Hart Dyke, M.P., on the question. Sir William said the matter had received his most careful attention. He saw in many quarters the present high price of sugar attributed to the Sugar Bounties Bill. He felt bound to enter a mild protest against the possibility of this, as the measure would not in any event be operative until August, 1891. The present price of sugar was the sole result of the foreign bounty system, which had destroyed the home production of sugar, and placed them entirely at the mercy of foreigners for a supply. They would read in the French trade paper *Journal des Fabricants de Sucre*, of April 3rd, 1889, the following:—“Authorities agree that sugar stocks are running short. By October they will not exceed two hundred thousand or two hundred and thirty thousand tons. Before that England will have to apply to fresh sources for her supply; but statisticians do not tell us what these sources will be. Rarely has there been such unanimity as to the brightness of the sugar producers' outlook. Stocks diminish every year from March onward, and taking the average mean diminution as a basis for the diminution of the present year, it may be estimated that the general stock will in October, 1889, be a hundred and seventy-five thousand tons, as against four hundred and seventy-one thousand eight hundred tons in October, 1888.” Sir William went on:—“Add to this that the imports of cane sugar into the United Kingdom for the first three months of 1889, as compared with the first three months of 1888, showed an extraordinary diminution of 98,835 tons (*vide* Board of Trade returns), and you have the true and unmistakeable cause of the present high price in sugar.” In a later letter Sir William Hart Dyke said:—“We are all divided upon it (the Sugar Bounties question) in Parliament. Some Radicals are for abolishing the bounty system; a large number against. The same division of opinion on our side. In my judgment to raise the cry that the possibility of the Convention being carried out has put the price is not enough for those who will be seriously injured by the change. Who raised the price? And how? And if the price has been raised at this juncture by the foreign producer, what guarantee have we that he will not do so again, however and

whenever it suits his purpose. These are questions we have to consider calmly and dispassionately."

Mr. Emerson said sugar had gone up a penny a pound. This meant on the consumption of the United Kingdom £12,000,000 per annum. It was, however, but merely a foretaste of what they might expect. Twenty-five years ago Swanley Junction was only a name, but it had now become a centre of activity and enterprise, and where £1 was paid for labour a few years ago £100 was now paid. This was due to fruit growing and jam making, the basis of which was cheap sugar. Without cheap sugar there could be no cheap jam, and expensive jams were out of the reach of the general public. If the Convention came into operation and the price of sugar increased to 4d. or 5d. per pound, the fruit growing industry must fail. Why had the Government placed themselves in this position? He could not see any other reason than that it was to satisfy the Protection tendencies of the party. The duty of all present was to protest in the strongest manner against this attempt to sacrifice them on the Sugar Convention altar, and they must insist on their markets being kept open to all comers for the supply of an article that they so much needed as sugar.

Mr. E. Pink said as they knew he was very largely interested in sugar, he was of opinion that the Convention should be completely condemned. It was a question for all, and they could not possibly protest too strongly against it. It was altogether departing from the legislation they had been taught to look for, and it was no better than a bungle on the part of the Government.

Mr. F. Goodyear contended it was more a poor man's question.

Professor Cheshire said he agreed with Mr. Goodyear. Nothing should be done which would tend to rise the price of sugar, which was such an important article in the common dietary. Sugar was force-producing food. The Sugar Convention was a monstrosity which everyone ought to denounce, and the Bill was certain to be rejected, because the common sense of the country would make itself felt.

Mr. E. Vinson moved the following resolution:—"That this meeting records its protest against the Sugar Convention Bill now before Parliament, believing that the Bill, if it becomes law, will be most injurious to cultivators of fruit and the public at large. He looked upon the Bill as protection in its worst form.

A working man employed at the jam factory seconded the resolution.

Mr. John Wood and Surgeon-Major Mee supported.

Mr. Albert Bath said it required a ton of sugar to a ton of fruit to manufacture it into jam. Dear sugar therefore meant dear jam. Sir William Hart Dyke approved of the Bill, and showed fear of the supply of sugar decreasing, but he must know the effect of this Bill would be to boycott France, Australia, Belgium, Switzerland, Sweden, Denmark, Turkey, Brazil, and the States, who would not be parties to the Convention, and the Bill if it became law would considerably lessen the supply, and an important article of food was thus made dearer to the labouring classes.*

The resolution was unanimously adopted, and it was further resolved to forward it to the members of the Government.

BETROOT SUGAR IN NEBRASKA.

The Louisiana Sugar Planter has the following copied from the *Rural New Yorker* :—

A good deal of interest is shown by the farmers of Nebraska in the establishment of an immense beetroot factory at Grand Isle. It will represent an outlay of \$500,000, and have at the outset a capacity for using up 350 tons of beets per day, and by means of additional machinery the quantity may be increased to 600 tons. The company has been experimenting for two years and is satisfied from its investigations that as far as soil and climate are concerned Nebraska is better suited for the growth of sugar beets than any sugar-producing region in Europe. Samples of experimental sugar have been sent abroad, where strong testimonials were received of its superior quality. So firm is the faith of many of the farmers about Grand Isle in the enterprise that they are ready to exchange their farms for stock in the company. It is estimated that well-cultivated land will yield 15 to 20 tons of beets per acre, and they can be sold at the mill for \$5 per ton. If the project proves successful, other factories will be established. A bill is now pending in the legislature which proposes that at the end of two years the state shall give a bounty of half a cent per pound on all sugar manufactured within her borders. If congress gives the proposed national bounty of one cent per pound on all cane, sorghum and beet sugar of domestic manufacture, there is little doubt that the amount of home-produced sugar will be immensely increased, and of these three sources of sugar the increase in the beet sugar product is likely to be the greatest.

* If the bounties are abolished, it will not lessen the production of beet sugar, and our cane supplies will be greatly increased. Is it not clearly in the interest of the jam makers, that that system should be adopted which will increase our supplies? *Ed. S.C.*

UNITED STATES.

REMARKS ON THE STATISTICAL POSITION OF SUGAR.

By W. HOFFMANN.

New York, 1st May, 1889.

According to our principal statistician the visible supplies of sugar in 1888 the world over were, on May 3rd, 1,129,000 tons, and on October 4th 527,000 tons, showing a diminution for the five months during which hardly any sugar is produced (Java forming the only exception), of 600,000 tons. To-day the visible supplies are 360,000 tons less than at the same date a year ago.

The imports in the three Atlantic ports (New York, Boston, and Philadelphia,) of the United States in 1888 were the following:—

	Four months from 1st Jan. to 30th April. Tons.	Five months from 1st May to 30th Sept. Tons.	Three months from 1st Oct. to 31st Dec. Tons.	Totals. Ton.
Cuba	196,000	248,000	19,500	463,500
Brazil	68,000	33,000	26,300	127,400
Manila	43,000	12,000	23,000	78,000
Sundries	4,000	15,000	6,000	26,000
Java	2,000	3,000	16,500	21,500
Brit. W. Ind. Islands and Trinidad	61,000	105,000	9,500	135,600
Porto Rico		24,000	500	37,000
Demerara		7,000	26,000	49,000
Hayti & San Domingo		7,000	200	17,000
	374,000	454,000	127,500	955,000
Europe. { Beet	3,000	9,000	51,000	63,660
{ Cane ....	.....	27,000	36,500	63,340
Totals	377,000	490,000	215,000	1,082,000

The deliveries during the identical periods were:—

309,400	538,400	223,200	1,071,000
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And the total stocks in the three ports on 1st January, 47,800 tons; 1st May, 149,600 tons; 1st October, 87,700; and 31st December, 32,000 tons.

During the first four months of the present year, ending 30th April, our imports have been:—From Cuba, 169,000; Brazil, 44,900; Philippines, 32,400; West Indies, 75,800; Sundries, 9,500 tons; together,

331,600 tons cane sugar; and from Europe, 25,600 tons beet; total, 357,200 tons; while the deliveries were 374,400 tons; our stocks amounting to-day to 67,000 tons.*

Unless consumption decreases, we shall require again before the 1st October 538,000 tons, and thereafter until the end of the year another 223,000 tons; together, 761,000 tons, or, perhaps, by allowing our stocks to dwindle down to a mere bagatelle, 40,000 tons less, say only 720,000 tons.

To supply these wants we look first to Cuba where the crop is admitted to be 100,000 tons short, 90,000 of which at least will have to be deducted from the quantity available for this country. We may then count on 375,000 tons supply altogether, 169,000 of which have already been received. The balance of 206,000 tons may reach us all before 1st October next.

The Brazilian crop has all been shipped, and most of it has arrived at destination. Our supplies from that source until 1st October will consequently be 30,000 tons less than last year. With an early crop and quick steamer shipments, as much as 40 to 50,000 tons Brazil sugar may possibly reach us between 1st October and 31st December, against 26,000 tons last season.

The crops in the West Indies do not promise to be as good as last year, and it is reported that shipments to Europe have been larger this year. The total shipments last year to the United States were 238,000 tons. Supposing we get the same quantity, which is however by no means certain, and deducting the 76,000 tons already received, we may yet count on 162,000 tons, which will probably be in by 30th September, except some 25-30,000 tons Demerara of next crop, which is the most that can be made and shipped in time to reach us before the end of December.

From Java we can expect nothing, or next to it, until after the 1st October. It is currently reported that our refiners have secured some 50,000 tons new crop steamer shipment, of which 40,000 tons may reasonably be expected to arrive between 1st October and end of December.

A large portion of the Manila crop is afloat, part by steamers to Gibraltar for orders to the United States or to Europe, for which reason it is impossible to estimate even approximately the quantity we

*According to Willett & Hamlin's Report, the stocks were 15,092 tons, in the three ports, on 1st May, 1889.—*Ed. S. C.*

shall receive of said shipments. But since prices in Europe do not rule below, but mostly above our own, it is not likely that we shall receive more than our usual share of the Philippine Islands crop, viz., in the neighbourhood of 80,000 tons. Making due allowance for steamer shipments, 40,000 tons may possibly arrive before 1st October, 30,000 between that date and the end of the year, and the rest thereafter.

For want of more reliable figures regarding the supplies from sundry sources the quantities of last year are repeated.

The expected supplies of cane sugar will then stand as follows:—

	From now to 1st Oct. Tons.	From 1st Oct. to 31st Dec. Tons.
Cuba	206,000	..... Nothing.
Brazil	2,800	..... 40,000
Philippine Islands	40,000	.. .... 30,000
West Indies ..	136,000	Demerara 30,000
Sundries	15,000	... .. 10,000
Java	Nothing.	..... 40,000
	<u>400,000</u>	<u>150,000</u>

To satisfy a consumptive demand equal to that of last year, the United States will have to bring from Europe before 1st October 140,000 tons, and during the last quarter of the year 70,000 tons. It is true that by letting our stocks run down to the lowest point consistent with prudence, only about 100,000 tons would be required before 1st October, but the supplies of cane for the next five months are estimated so very liberally that they may in fact fall short of the calculation. Cuba, for instance, kept back last year some 20,000 tons until after 1st October, and may do it again. Spain may buy as much of her crop as last season, and deprive us of the 10,000 tons, which is the proportion allotted to Spain in Cuba's deficit. Finally, the West Indies may not be able to give us the 136,000 tons calculated upon, either because they will not be produced, or because the exports to Europe have really been larger than last year. Anyway they may retain, the same as last year, 10,000 tons for shipment after 1st of October. Thus, under these contingencies, we may be obliged to import even as much as 150,000 tons of sugar from Europe before the 1st October.

NOTES ON BOOKS.

THE LIMITS OF FREE TRADE. By a Liberal. 8vo., pp. 52. London: Trübner & Co., 1889. Price 6d.

This pamphlet formed the substance of a lecture delivered to the Bromley District Liberal Association, by G. Buchanan, Esq., M.Inst.C.E., F.R.G.S., Vice-President.

He wishes it to be understood that he is in no way connected with the *Fair Trade* movement. This movement may be good and practicable or impracticable, but what he objects to is, and what every rational and disinterested man ought to object to is, *unfair trade*.

It would be impossible in discussing the limits of Free Trade not to bring into prominence the effects of the system of bounties, and about one-fourth of Mr. Buchanan's lecture bears upon the question of sugar and sugar bounties, which we have pleasure in reproducing, and commending to the attention of those especially who are in need of more light upon this question.

SUGAR AND THE SUGAR BOUNTIES.

I now come to deal with the *sugar* industry, and more especially with the effects of the bounty system as illustrated therein, and I think the present time is peculiarly appropriate for ventilating this question, inasmuch as it seems to be the intention apparently of a large section of the Liberal party to make an onslaught upon the present Government this session on this very subject. Many people may have read the correspondence which appeared in the *Times* and other journals on this question, and may have noted the letters of Sir Thomas Farrer, of the Board of Trade. Sir Thomas Farrer argues, that if bounties were done away with, the price of sugar would be increased (to the prejudice of the consumer), but a memorial to Lord Salisbury, which has recently been presented, signed by the leading merchants in the City of London,* contradicts this, and I think that these *practical* men ought to know more of the questions affecting their business than Sir Thomas Farrer.† But a point overlooked, and

* Letter, dated 30th November, 1888, addressed to the Marquis of Salisbury, enclosed in a letter from the Chairman of the British West India Committee, showing that abolition of bounties will not increase price of sugar, and explaining the reason why this would still benefit the British producer. (See *Sugar Cane* for January, 1889, page 18.)

† Sir Thomas Farrer and Mr. Giffen's statements, I may mention, are attacked and contradicted by competent authorities in every important particular—e.g., Sir Thomas Farrer says that bounties cause a saving to this country of £3,000,000 per annum; this is contradicted by the memorial above alluded to. Sir T. Farrer again says that the number of workmen affected by bounties in this country is only about 5000, but a letter to Mr. Gladstone by the Workmen's National Association for Abolition of Sugar Bounties, of February 1884, states that the number of men thrown out of employment by the sugar bounties amounts directly and indirectly to 291,000: and Mr. Quintin Hogg, a large West India sugar estate proprietor, says (speech at Conference, March 26, 1886) that the number of people in the West Indies *alone* affected by the bounties was about 1,500,000. Then, as regards the great "jam" argument, it appears that just as much jam, confectionery, and biscuits, were made *per head of the population* when sugar was double the price as there are made now; and, moreover, Messrs. Kellier & Co., who are amongst the largest jam or marmalade manufacturers in the Kingdom, are in favour of abolition of the bounties.

to which I want to draw *most earnest attention* is, that there is, or ought to be, in every country, such a thing as *free production* as well as *Free Trade* (so called), and that we must not entirely sacrifice the former at the shrine of the latter. Free Trade, if you *will it so*, but at all events let us not handicap production in our own country. I submit, therefore, that a system which does not allow *freedom of production* is unjust to the producer, and cannot rightly be called "*Free Trade*." I will illustrate by an extreme case an example of what I mean by "*interference with freedom of production*:" Suppose that in a London street there are two rival shoemakers, one a *German* the other an *Englishman*—the German gets all the leather for his shoes provided for him *gratis* by his Government, but the Englishman has to *buy* his. How is it then possible for the latter under these conditions to successfully compete with the former? In like manner, if trade be drawn out of a country by artificial and unnatural means is that *Free Trade*? But that in effect is what bounty giving by foreign Governments means in its results on the industries affected in this country.

I now submit the following figures, which will show the rise and progress of the sugar industry in Germany, and the tale it tells is most remarkable. And I want to draw particular attention to this matter, because some theorists and politicians in this country tell us that the Germans in this matter of bounties are most foolish in view of their own interests*—poor benighted Germans! Do they not know how to take care of themselves? We shall see.

In 1836 there were only 141 tons of sugar produced in Germany. In 1842, 13,000 tons; 1863, 142,000 tons; 1875, 358,000 tons; 1881, 600,000 tons; and in 1888-9 the crop is estimated at about 1,000,000 tons.

From the above it will be seen that Germany (in which a few years ago the sugar manufacture was practically unknown), has now become the largest sugar-producing country *in the world*; so here we see a vast industry established in Germany by the wisdom of her statesmen (which has been established and is carried on at utter variance with modern English Free Trade doctrines), employing hundreds of thousands of her population, benefiting her agricultural districts, and bringing her great wealth. The same state of things, as regards the sugar industry, exists in nearly every other Continental country; but although we may (or ought to) admire the statemanship that has brought such benefits on those countries, it would be but reasonable that we should have some care for our own, and if our Free Trade principles prevent *our* granting bounties to *our own* people, let us at all events—in the name of common sense—not assist foreign nations to injure our own industries.

Now, there is not at present much agitation in this country on the subject of bounties, because they have as yet only affected an industry of secondary importance, but supposing (and we *can* suppose such a

* It seems to be generally taken for granted that bounties are injurious to the nation giving them. But the only way to prove this would be to show that the direct and indirect advantages and wealth created by bounty-fed industries in the countries giving bounties was not worth the money expended on them. Is the sugar industry in Germany not worth the money that has been spent over it? Is it not better to spend money in creating new industries or in educating the people than in "bloated armaments," for example?

thing) that the system, owing to our supine indifference, were extended to our cotton, iron, and other large industries of the kingdom—supposing, I say, that *they* were to be placed in the same plight as the sugar planters in our Colonies, and sugar refiners in this country and their allied trades—would the nation then wake up? But because the sugar industry (in comparison with the large industries I have alluded to above) is a minor one, it is no reason that it should be treated with injustice. A British subject should be treated with *fair-play*, even although he be a sugar refiner or sugar planter; but in our dread of infringing Free Trade canons—and fear lest sugar might be made a farthing per pound dearer—we give benefits to the foreign, and allow obstacles to be placed in the way of the British, producer.

But now, further, we may suppose for the sake of argument, that each of our leading industries were one after the other attacked in the same unfair way,* and from these and other causes to which I allude in this lecture gradually decay or be transferred to other countries, what would be left for an Englishman then but to emigrate? and what consolation for him would it be to tell him that in England foreign articles of all kinds were much cheaper than English, and that he could buy *everything very cheaply—if he had the money.*†

In effect, bounty giving by foreign governments, as regards its results in England, is just the same as if our own Government put a tax on the production of the particular article in this country, while the same thing from foreign countries giving the bounties were admitted duty free. Granting protection to foreigners, which enables them to compete on advantageous terms with our own producers, is surely an absurd and unjust policy.

The arrangement proposed in the New Sugar Bounties Convention seems a fair attempt to grapple with this question; although, as it requires the co-operation and consent of so many nations, it may be difficult to work it harmoniously, but the rigid dogmas of unlimited Free Trade doubtless stood in the way of the more simple and straightforward course of imposing a countervailing duty equal in each case to the amount of the bounty.

Mr. Buchanan next deals with the important question of growing sugar beet and making beet sugar ourselves. As our readers are

* Since delivering this address, I have quite accidentally come across a published letter of Baron de Worms on the subject of bounties, in reply to a resolution adopted at a meeting of working-men held last year at Nottingham, and of which the following extract shows that the same views which I express are already entertained by men having a thorough knowledge of the subject:—"It is important that you should bear in mind that the blight which, through the bounties, is now cast on our sugar trade, may at any time extend its pernicious influence. As a matter of fact, we have before us evidence that, indulging a fallacious belief in the value of subsidies in the promotion of national industries, foreign governments are by no means disinclined to do for other branches of commerce what they have done for the sugar trade. Bounties may be given by foreign countries on coal, iron, wool, or on manufactured goods. We must, therefore, use our utmost endeavours to put an effectual check on the bounty system."

† We have a striking illustration in even an integral portion of the United Kingdom to show that *cheapness* is of no avail to further the prosperity of a country in the absence of manufacturing industries. I refer to Ireland, where the cost of living is some 25 to 30 per cent. cheaper than in England, and yet her population, through dire distress, has declined at each decade, and within the living memory, from about 8,000,000 in 1841 to about 5,000,000 at the present time. If this had happened in any Protectionist country it would have been held up as a warning example against Protection. There is no doubt that various industries might be established in Ireland with a little judicious fostering, and were it not for the restraining influence of unlimited Free Trade preventing any new industry from being planted and taking root.

aware, experiments have been tried in this country without success, and although failures often precede success, we are unable to take as sanguine a view of this subject as the author.

Reference is made to the evidence of Mr. Martineau and Mr. Duncan, before the Royal Commission appointed to inquire into the Depression of Trade, a full report of which we gave in the *Sugar Cane* for September, 1886, page 453. In answer to question No. 13304, Mr. Duncan stated it as his opinion that beet sugar could be made in England to cost about 15/6 per cwt. In a normal state of things, this does not hold out a future for beet growing in England, seeing that Germany can without bounties, produce and sell beet sugar at 14/- per cwt. with a good profit.

CAN SUGAR BE MADE IN ENGLAND ?

But there is another and vastly more important aspect in which we have to view the bounty question, and that is in its effects upon the agriculturists, agricultural labourers, and occupiers of land in this country. The production of sugar ranks now next to corn, or perhaps cotton, the largest industry in the world. I have already shown what wealth and prosperity this vast industry brings to the agricultural classes of the continent of Europe. The production of sugar in Europe, although only a few years ago quite insignificant, is now larger than that of all the rest of the world put together.

The following are the estimated figures as brought down to the latest dates :—

Total Continental sugar production 1888-89..	..	2,808,000 tons
„ all other countries, ditto .. .. .	..	2,452,000 „

We have heard a good deal respecting the advisability of the improvement of fruit culture, and the introduction or development of other branches of rural industry into or in this country, and it does seem to be somewhat strange that so far-sighted a man as Mr. Gladstone should, while advocating the manufacture of jam, have said nothing as to the introduction of the manufacture of the sugar of which the jam is composed. In the United Kingdom far more sugar is consumed per head of the population than in any other country in the world. The present annual consumption is about 1,200,000 tons, value about £25,000,000. Conceive what an advantage it would be to this country if this sugar, or a portion of it, could be produced in England, instead of getting it from foreign countries.

Now, supposing that the sugar industry were introduced and established in England and Ireland, and developed as in Continental countries, what would be the result? Why, that agriculture would be lifted out of its present drooping despondency into flourishing prosperity; the congested population of our towns would be spread more over the country, where not only agricultural labourers would find abundant employment, but factories for skilled labour would be

* The figures are taken from a Monthly Report of the Produce Markets issued by an eminent firm of brokers.

dotted all over the rural districts of the kingdom;* agricultural land, now of so little value, could be utilized; farming, instead of being in the depressed condition that it now is, would become one of the most profitable occupations in the country, and, finally, it would give us the most effectual aid that could be devised for solving the agrarian question in Ireland. To prove the foregoing it is only necessary to look at the results of the large joint-stock sugar factories on the Continent, whose accounts are published, and from them we find that, even with the depressed prices of sugar (and I call *particular* attention to this *latter fact*), their profits last year ranged from 5 to 50 per cent. per annum.† Well, now what is there to prevent what I have just sketched from being carried out?—a consummation in the interests of British agriculture most devoutly to be wished. It is not the nature of our soil or climate, for all the countries of Europe in the same latitude as we are, from Russia, Poland, and Roumania in the east, to Holland, France, and Belgium in the west, are profitably engaged in this industry.‡ Moreover, experiments and tentative trials made in England have shown that, as regards its adaptability to this country, there is, with the exception of the difficulty attendant upon introducing a novel industry, and what I am about to point out, actually no obstacle.§

But what *mainly* stands in the way is *this*. Any unhappy individual who attempted to carry on a sugar factory and beetroot cultivation in this country would soon find himself in a similar position to that of the English shoemaker in the example I have already given to you. Dire necessity would oblige him speedily to abandon the undertaking.

Then why, it may be asked, does not our Government step forward to the relief of our agriculturists and working classes, not only by relieving our people from the pressure of bounty-fed competition, but also by protecting such an industry in its infancy, and until it was able to stand upon its legs? Why do they not? Why? Because the rigid dogmas of "Unlimited Free Trade" stand in the way—Free Trade under *all* circumstances and for *all* countries—*laissez faire* on the part of our Governments, and the rigid canons of unlimited Free Trade stretched to an extreme everywhere, until Free Trade is converted into *unfair* trade. And, until the people of this country begin to take a more rational view of this question, a course such as I have

* The following is an extract from a letter to me on the question of beetroot culture and manufacture in England, written by a gentleman who knows, perhaps, more of the subject than any other man in England. After expressing his opinion that the sugar industry could be introduced with profit into England, he says, "As to the advantage of sugar growing, this is very evident—it means a great improvement in agriculture, a better class of men on the land, employment in winter, increased crops of corn and cattle."

† From information extracted from the *Deutsche Zuckerindustrie*, as given in *Sugar Cane* for September, October, November, 1888, and January, 1889.

‡ The following are the European countries now engaged in the culture of the sugar beet and the manufacture of the sugar—viz., Russia, Denmark, Sweden and Norway, Germany, Poland, Austria, Hungary, Roumania, Holland, Belgium, France, Spain, Italy. It now, moreover, appears, from an article in the *Deutsche Zuckerindustrie*, that a beetroot sugar factory is to be established even in Portugal under fiscal arrangements which will give its product an advantage of 10s. per cwt. In Spain and Italy the amount of beet sugar produced is as yet but small, the manufacture having been but recently introduced.

§ Evidence of Mr. Duncan and Mr. Martineau (April 15, 1886), before the Royal Commission appointed to inquire into the Depression of Trade.

indicated would probably be looked upon but as the thin edge of the wedge, and the beginning of a policy to repeal most of our Free Trade legislation—a policy which I certainly do not advocate.

But it appears to me that people who only casually examine the subject of fiscal policy get so many dogmas and canons respecting Free Trade dinned into their ears by writers on political economy, whose views are derived from *theory* only, that they in their turn go on repeating them without taking the trouble to investigate for themselves the question as to whether, in the varying conditions of human society, such dogmas and canons are always and everywhere applicable. The best way for a man to get out of the groove of such ideas, and examine the question impartially, is for him in the first place to lay aside the idea that it is impossible for wisdom in fiscal matters to exist anywhere outside of England; and, secondly, to impartially examine the fiscal policy of other nations of the world in their effects on the commercial and industrial progress of the respective countries. If he will do so, he will soon come across facts which, although generally ignored by writers and theorists in England, will shake his faith in the commonly received theories respecting unlimited Free Trade.*

AVERSION OF ANIMALS TO SACCHARINE.

Mr. A. Stiff who lately contributed an article to the *Vienna Zeitschrift für Zuckerindustrie*, now states that he has made experiments confirming the conclusions of Berthelot and Liebreich as to the aversion for saccharine shown by dogs, cats, bees, wasps, &c. He offered saccharine on his finger to two dogs, who, contrary to their custom with sugar, refused to lick it off. Neither caresses nor threats could induce them to eat bread on which only a very small portion of saccharine had been strewn. Water, sweetened with small quantities of saccharine, which he poured down their throats, was instantly thrown up by them. Finally the two animals took to flight, and would not allow him to come near them again. He mixed a very small

* A well-known writer on Free Trade, Mr. Augustus Mongredien, while expatiating on the great increase of British trade, and leaving out reference to the *much greater* increase of that of foreign competing nations, gravely writes as follows (see "Free Trade and English Commerce," 5th edition, chap. ix., p. 35): "Of this enormous expansion of her foreign commerce England owes the greater part to her adoption of Free Trade. . . . True, that in most countries some increase of foreign trade has taken place within the same period, but in many cases it has only been slight, and *in no instance has it progressed in anything like the same ratio*!"!!! The italics are mine. Mr. Mongredien surely could not have made himself adequately acquainted with the statistics bearing on the question before writing the foregoing. There are other inaccuracies in Mr. Mongredien's book, but I have only space here to quote the two following—viz., in chapter xx. he says, "The trade of the rest of the world is mostly in a more depressed state than it is here," and in same chapter he says further on, "The fact is, that, while industrial prosperity has declined in England, it has, in spite of all the Protection lavished upon it, declined in a far greater degree in the United States." In reply to this, I would simply refer the reader to the statistics of the United States trade, as given herein.

quantity of saccharine with the food of three cats, which they only received once a day. They left it absolutely untouched. In spite of their being very hungry, as was evident from their cries and movements, they did not meddle with the food during four hours. After that time he put before them food which was free from saccharine, which was at once devoured, after they had sniffed at it for some time. He intends to continue his experiments with other animals.

MILLIONAIRES.

M. de Varigny, in his recent articles in the *Revue des Deux Mondes*, states that there are in the world some 700 millionaires, each of whom has a capital of not less than a million sterling. Of this number 200 belong to Great Britain, 100 to the United States, 75 to France.

The richest man is Mr. Jay Gould, whose capital when he left home at the age of twelve consisted of a suit of clothes and half a dollar. He is now said to be worth \$300,000,000, or say £60,000,000, and his annual income is stated to be £2,800,000, or five times that of our richest peer, the Duke of Westminster.

Mr. J. W. Mackay comes second, with a capital of £50,000,000 and an income of £2,500,000. The English House of Rothschilds is the third on the list, with a capital of £40,000,000, and then the following:—

	£		£
Mr. Astor.....	38,000,000	Duke of Northumberland	5,000,000
Mr. Vanderbildt.....	25,000,000	Marquis of Bute.....	4,000,000
Mr. J. B. Jones	20,000,000	Mr. Aug. Belmont.....	4,000,000
Duke of Westminster..	16,000,000	Mr. R. Garrett	4,000,000
Mr. Russell Sage	12,000,000	Mr. P. Morgan	3,600,000
Duke of Sutherland ..	6,000,000	Mr. Sydney Dillon.....	2,000,000
Mr. Gordon Bennett..	6,000,000	Mr. Cyrus Field.....	2,000,000

It would be an interesting and instructive study, that of the ways and means which have been employed in amassing such wealth; a study which, however, would not, we fear, be altogether favourable to commercial morality.

MONTHLY LIST OF PATENTS.

Communicated by Mr. W. P. THOMPSON, C.E., F.C.S., M.I.M.E.,
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ENGLISH.

APPLICATIONS.

7130. H. A. HUGHES, London. *The disintegration or shedding of cane.* (Complete Specification.) 29th April, 1889.

7131. H. A. HUGHES, London. *The manufacture of sugar liquor from sugar cane by diffusion.* (Complete Specification.) 29th April, 1889.

7343. J. FOSTER, Glasgow. *Improvements in vacuum, distilling, and evaporating apparatus.* 2nd May, 1889.

7517. G. ADANT, London. *Improvements relating to apparatus for the manufacture of sugar.* 4th May, 1889.

ABRIDGMENTS.

7411. ALEXANDER HORN, of the Confectionery Works, Hackney Wick, Middlesex. *An Improvement in Saccharometers.* May 19th, 1888. In addition to and preferably side by side with the ordinary Beaumé scale, this inventor places a second scale, which indicates the weight of sugar contained in a given quantity of the liquid being tested. The scales may be enclosed as usual in the glass of the saccharometer.

8052. G. F. REDFERN, of 4, South Street, Finsbury, London. (A communication from abroad, by W. P. ABELL, of L'Union, Essequelu, British Guiana, Whitworth Scholar and Engineer.) *Improvements in and relating to centrifugal machines, for use in the manufacture of sugar.* May 19th, 1888. Relates to mechanism, whereby the sugar discharged through the bottoms of pans or baskets of centrifugals is conveyed to an ordinary elevator or elsewhere without manual labour. In place of the endless hands or screw blades hitherto employed for the purpose, a helical bar or rod is used. The said conveyor revolves in a special box or trough, placed in such a position that the sugar discharged through the bottom of an ordinary centrifugal sugar-curing machine basket, granitates into the box. The machines are fitted with molasses catchers.

8053. G. FLETCHER, of Masson Works, Litchurch, Derby, Engineer. (Partly communicated by G. BROCKLEHURST, of Island of Barbados,

Engineer.) *Improvements in evaporating pans.* June 1st, 1888. Relates to open pans which are heated by steam. A hollow drum, located within the pan, is traversed by a number of heating tubes and a large central tube, through which the liquor circulates. The drum is heated by steam.

783. J. HARNUNG and C. RABE, of Sangerhausen, Prussia, Germany. *Improvements in machines for slicing or cutting sugar cane, beet root, and the like.* January 15th, 1889. This machine has the object of preventing fibrous or other matters from clogging up the space in front of the revolving cutter. The canes are fed downwards in an oblique direction on to the top of a revolving flat cutting device. Nine figures of drawings are shown.

AMERICAN.

ABRIDGEMENTS.

401238. ALEXANDER YOUNG, of Honolulu, Hawaii. *Apparatus for evaporating saccharine or other liquids.* April 9th, 1889. Consists of apparatus for evaporating, in vacuum or otherwise, in which the steam used for heating the pans is superheated in its passage from pan to pan by means of the hitherto waste heat of the furnace gases. The steam from the substance under treatment may also be utilized in a similar manner.

401363. LOUIS ANTOINE MORESI, Junr., of Jeaverette, Louisiana. *Machine for granulating and drying sugar.* April 16th, 1889. A circular sieve revolves in an open outer casing. The moist sugar is fed on to the surface of this sieve, and its passage there through is assisted by means of a stationary metallic brush above its surface. A number of radial arms sweep the sugar from the outer casing into discharge openings whence it passes to a discharge chute, along which a current of air is forced by a fan to assist in drying the material. Warm air may be employed if desired.

401612. H. W. WALKER and F. L. PATTERSON, of Greenock, Renfrewshire, Scotland. *Apparatus for moulding and refining sugar.* April 16th, 1889. An annular mould of truncated conical form is provided, and a series of flat annular plates is placed therein, and retained by a coner. The sugar, in the form of "masse-cuite," is led into the mould while revolving at a moderate speed and is thereby caused to fill the same in an even manner. A sleeve fills the spaces between the inner ends of the annular plates. The sugar is allowed to settle and crystallize, and when ready the mould is replaced on its horizontal shaft. The sleeve is removed, and the green syrup is

removed by revolving. When the mass has been cleared of green syrup the operation of liquoring is applied. The saturated solution of sugar may be poured into the mould through the space formerly occupied by the sleeve above-mentioned. The resulting dry plates of sugar may easily be broken into blocks.

402056. FRANCOIS BIANCHI, of New Orleans, Louisiana. Assignor of one half to LEON BOYER, of New Orleans, Louisiana. *Diffusion apparatus*. April 23rd, 1889. This seems to comprise nearly all the essential features of a complete plant. The first claim of the patent is as follows:—The combination with a cane-crushing mill of rotary cutters enclosed in a suitable case for finely dividing the crushed cane, an endless conveyor for moving the cane from said mill to said cutter case, a shoot leading from the latter into a stationary tank, and a revolving drum sub-divided into compartments, and provided with rotary agitators.

402081. HENRY A. HUGHES, of Rio Grande, N.J. *Apparatus for removing end sections from stalks*. April 23rd, 1889. A machine for slicing canes or stalks into short lengths, which, automatically, separates or refuses the end pieces which contain the seed bodies or broom heads. A horizontal conveyor feeds the stalks to the broad periphery of a rotary disc provided with cutters, and a space is left between the end of this conveyor and this cutter, so that when the uncut portion of the stalk containing the seed is too short to span this space, it falls down and is in this manner kept out of the reach of the cutters.

402082. HENRY A. HUGHES, of Rio Grande, N.J. *Process of sugar production from sorghum*. April 23rd, 1889. This is a process for producing concentrated sugar liquor from sorghum, which consists in first dividing the cane into short lengths, and freeing it from seed heads, leaves, and sheaths, &c., from the cane; third, subjecting the cane, to shredding or fibrous disintegration; fourth, subjecting the disintegrated cane to diffusion in hot water, until the water dissolves a given percentage or quantity of sugar; and fifth, subjecting the liquor so obtained directly to evaporation, until a concentrated liquor suitable for treatment in the vacuum pan is produced.

402083. HENRY A. HUGHES, of Rio Grande, N.J. *Process of sugar production from sorghum*. April 23rd, 1889. This is a process for continuous diffusion, and consists in first charging a given number of vessels with hot water, and in subjecting successive masses of cane

in a disintegrated condition to the influence thereof, thereby bringing the liquid in each vessel to a predetermined density.

GERMAN.

ABRIDGEMENTS.

45754. M. TAUSSIG, Sedlec, near Kuttenberg. *Guiding mechanism for cutting machines with horizontal axle.* March 18, 1888. An anchor-shaped piece is loosely suspended from the axle of the slicing machine. The sides of the two arms of this anchor slant outwards, forming a ridge at the top. The slices are thus driven out from the interior of the drum.

46377. S. M. LILLIE, Philadelphia. *Evaporating apparatus.* February, 28th, 1888. This apparatus consists of several evaporators, each of which is provided at the base with a collecting chamber, and at the top with a supply apparatus, and further with steam escape pipes, the whole being united to form a multiple machine. A surface heater is attached to each evaporator. These heaters are connected by means of pipes, and are supplied with steam from the evaporators, through the steam escape pipes above mentioned. The liquid is conveyed from one evaporator to another by pumps or other suitable arrangement.

45602. HALLESCHER MASCHINENFABRIK und EISENGIESSERIE, Halle a.d. Saale. *Reversing mechanism for juice pumps.* January 31st, 1888. This reversing mechanism is formed by two slide bars, one of which is set in motion by floats, and imparts the steam or other pressure, which is made to act on it, to a piston, in such manner that this latter, when the receptacle for liquid is full, opens the supply pipe for steam or compressed air and closes the escape. If, however, the receptacle be empty, the said piston will close the supply pipe, and open the escape for the steam or compressed air.

45611. FIRMA HAVELKA & MESZ, Prag-Carolinenthal. *Counter current heating tubing for vacuum boilers for sugar.* March 3rd, 1888. Each consecutive vertical pair of heating tubes is connected at the ends by small pipes, so that the steam which passes through one pipe from the centre to the circumference must return through the other in the opposite direction.

46014. F. SCHULTZE, Berlin. *Water condenser.* March 21st, 1888. The cold water enters through a pipe passing up the centre of the condenser, and is discharged through a rose nozzle at the top, from whence it falls like rain, and is carried off by a drain pipe. The

material to be concentrated enters at the side of the apparatus, and is carried upwards to the air pump.

46019. C. BÖGEL, Brieg, Reg. Bez. Breslau. *Process for extracting sugar from molasses or other material containing sugar in solution, by means of calcium oxychloride or basic chloride of calcium.* February 25th, 1888. The calcium oxychloride required for the process is produced by mixing pulverised chloride of calcium and burnt lime and sprinkling with water. Aqueous or alcoholic solutions of sugar or of sugar lime are treated with the basic chloride of calcium obtained as above shown, in order to precipitate the sugar lime.

46023. H. JELINEK, Prag, and M. TAUSSIG, Sedletz, near Kuttenberg, Bohemia. *Process for warming and washing beet slices.* May 27th, 1888. The process is carried out as follows:—When the pieces of beet have been placed in the diffuser, the latter is filled up, either with water from the reservoir or with juice from the preceding diffuser, by means of the ordinary apparatus, and either from above or below. This juice or water must pass through calorifiers in which it is not, as before, heated to a higher temperature than is required for diffusion, but only to the normal temperature of diffusion, so that the beet is not scalded. As soon as this has taken place the juice is pumped out of the diffuser into the calorifiers, where it is heated to the temperature of diffusion, and then returned to the diffuser. This process is repeated till the right temperature is reached.

Patentees of Inventions connected with the production, manufacture, and refining of sugar will find *The Sugar Cane* the best medium for their advertisements.

The Sugar Cane has a wide circulation among planters in all sugar producing countries, as well as among refiners, merchants, commission agents, and brokers, interested in the trade, at home and abroad.

Dioscorides (probably lived in the first century B.C.), who is the first that mentions sugar by name, is also the first who speaks of the medicinal qualities of sugar. He says: "It opens the bowels and is good for the stomach, when drunk dissolved in water; it relieves pains in the bladder and kidneys; and discusses those films which grow over the pupil of the eye, and cause a cloudiness in the sight." The latter part of this passage implies the external application of sugar. Blowing powdered sugar, or fine sugar candy into the eyes, has long been a popular practice to remove films and ophthalmies. Perhaps the practice originated with Dioscorides.—Dr. Moseley on Sugar, 1799, page 77.

IMPORTS AND EXPORTS (UNITED KINGDOM) OF RAW AND REFINED SUGARS.

JANUARY 1ST TO APRIL 30TH, 1888-1889.

Board of Trade Returns.

IMPORTS.

RAW SUGARS.	QUANTITIES.		VALUE.	
	1888.	1889.	1888.	1889.
	Cwts.	Cwts.	£	£
Germany	905,242	2,375,329	644,795	1,815,443
Holland	70,526	167,150	48,863	121,112
Belgium	322,808	391,474	214,618	247,772
France	1,179	31,498	1,149	21,570
British West Indies & Guiana	802,952	766,105	674,624	660,469
British East Indies	177,412	139,049	89,615	86,374
China and Hong Kong .....	.....	.....	.....	.....
Mauritius	57,061	65,997	39,294	61,023
Spanish West India Islands	246,704	34,000	182,295	28,050
Brazil	1,338,236	552,180	855,317	373,947
Java	1,752,953	479,610	1,362,666	418,868
Philippine Islands	116,553	138,285	57,609	83,364
Peru	208,989	209,905	158,678	158,882
Other Countries	198,767	225,669	142,507	161,494
Total of Raw Sugars ..	6,199,382	5,576,341	4,472,030	4,238,368
Molasses	78,476	103,495	26,242	35,367
Total Sugar and Molasses ..	....	....	4,498,272	4,273,735
REFINED SUGARS.				
Germany	945,420	1,616,804	827,989	1,492,153
Holland	380,202	486,362	353,528	457,036
Belgium	79,950	101,017	76,516	98,804
France	289,899	422,943	265,163	388,991
United States	10,699	7,838	9,005	6,742
Other Countries	192,379*	343,258	150,706*	290,337
Total of Refined	1,898,549	2,978,222	1,682,907	2,734,063

EXPORTS.—REFINED SUGARS.

	Cwts.	Cwts.	£	£
Sweden and Norway	17,716	30,955	15,137	24,037
Denmark	21,193	44,839	15,383	33,591
Holland	26,781	32,194	19,983	23,395
Belgium	8,293	9,004	6,324	6,084
France	2,276	4,391	1,645	3,204
Portugal, Azores, & Madeira	30,564	23,011	22,756	16,434
Italy	23,529	27,444	17,607	21,248
Other Countries	57,520	49,270	47,271	39,143
Total of Exports	187,872	221,508	146,106	167,136

* Entirely from Russia.

SUGAR STATISTICS—GREAT BRITAIN.

TO MAY 25TH, 1889 AND 1888. IN THOUSANDS OF TONS, TO THE NEAREST THOUSAND.

	STOCKS.		DELIVERIES.		IMPORTS.	
	1889.	1888.	1889.	1888.	1889.	1888.
London	36	62	117	107	121	114
Liverpool ..	59	132	125	111	90	159
Bristol	3	4	27	19	27	21
Clyde	55	48	100	92	132	96
Total ..	153	246	369	329	370	390
	Decrease.. 93		Increase.. 40		Decrease.. 20	

SUGAR STATISTICS—UNITED STATES.

(From Willett and Hamlin's Circular.)

FOR THE FOUR PRINCIPAL PORTS. IN THOUSANDS OF TONS, TO THE NEAREST THOUSAND. FOR APRIL, 1889 AND 1888.

	STOCKS.		DELIVERIES.		IMPORTS.	
	May 1st.		In April.		In April.	
	1889.	1888.	1889.	1888.	1889.	1888.
New York	14	100	90	53	85	71
Boston	1	10	18	21	18	23
Philadelphia	—	5	24	15	23	15
Baltimore . . . . .	..	..	..	..	..	..
Total	15	115	132	89	126	109
	Decrease.. 100		Increase.. 43		Decrease .. 17	
Total for the year			374	309	357	376

NEW YORK PRICES FOR SUGAR.

From Willett, Hamlin & Co.'s Report, May 16th. 1889.

FAIR REFINING.	96c/o CENTS.	GRANU- LATED.	STAND. A.	STOCK IN FOUR PORTS.
May 16, 1889.—6 5-16c.	7½c.	8½c.	8½c.	Jan. 1, 1889— 32,254 tons.
May 17, 1888.—4½c.	5½c.	6½c.	6 3-16-½c.	Jan. 1, 1888— 47,798 tons.
May 19, 1887.—4 7-16c.	5½c.	5 11-16-¾c	5 5-16c.	Jan. 1, 1887—102,279 tons.
May 20, 1886.—4½c.	5½c.	6½-5-16c.	5½c.	Jan. 1, 1886— 57,328 tons.
May 21, 1885.—5½c.	5 13-16c.	6½c.	6½c.	Jan. 1, 1885— 89,186 tons.
May 15, 1884.—5 5-16c.	6½c.	7 1-16c.	6½c.	Jan. 1, 1884— 60,900 tons.
May 17, 1883.—7½c.	7½c.	8 13-16c.	8½c.	Jan. 1, 1883— 50,297 tons.
May 18, 1882.—7½c.	8 3-16c.	9½-¾c.	9 5-16-¾c.	Jan. 1, 1882— 43,927 tons.
May 19, 1881.—7 7-16c.	8½c.	10c.	9½c.	Jan. 1, 1881— 66,999 tons.
May 13, 1880.—7 9-16c.	8 9-16c.	9½-¾c.	8½-¼c.	Jan. 1, 1880— 63,558 tons.

STOCKS OF SUGAR IN THE CHIEF MARKETS OF EUROPE ON THE
30TH APRIL, FOR THREE YEARS, IN THOUSANDS
OF TONS, TO THE NEAREST THOUSAND.

Great Britain.	France.	Holland	German Empire.	Austria.	Remaining four principal ports.	TOTAL 1889.	TOTAL 1888.	TOTAL 1887.
153	170*	21	120*	120*	20	604	743	762

*Estimate.

CONSUMPTION OF SUGAR IN EUROPE FOR THREE YEARS, ENDING
30TH APRIL, IN THOUSANDS OF TONS, TO THE
NEAREST THOUSAND.

Great Britain.	France.	Holland	German Empire.	Austria.	Remaining four principal ports.	TOTAL 1889.	TOTAL 1888.	TOTAL 1887.
1301	446	37	440	240	354	2818	2657	2690

ESTIMATED CROP OF BEET ROOT SUGAR ON THE CONTINENT OF EUROPE
FOR THE PRESENT CAMPAIGN, COMPARED WITH THE ACTUAL CROP,
OF THE THREE PREVIOUS CAMPAIGNS.

(From *Licht's Monthly Circular*.)

	1888-89. Tons.	1887-88. Tons.	1886-87. Tons.	1885-86. Tons.
France.....	470,000 ..	392,824 ..	485,739 ..	298,407
German Empire ..	990,000 ..	959,166	1,012,968 ..	838,131
Austro-Hungary..	525,000 ..	428,616 ..	523,059 ..	377,032
Russia and Poland.	510,000 ..	441,342 ..	487,460 ..	537,820
Belgium	140,000 ..	140,742 ..	135,755 ..	93,690
Holland	45,000 ..	39,280 ..	36,098 ..	28,818
Other Countries..	55,000 ..	49,980 ..	49,127 ..	46,075
Total....	2,735,000	2,451,950	2,730,206	2,219,973

Mr. Licht in his last *Monthly Circular* gives his estimate for 1889-90, but as all such figures at this early stage are simply guess work, we do not give them; the general impression is that the sowings for the coming campaign are from 8 to 10 per cent. larger than for the present season, but what the result in sugar will be, neither Mr. Licht nor anyone else can tell. There are some people still left who consult weather-predicting almanacs in order to know what kind of weather we are going to have, and such people may value these early forecasts of Mr. Licht's.

STATE AND PROSPECTS OF THE ENGLISH SUGAR MARKET.

For the first fortnight in May the raw market was dull, and the price of Beet 88% gave way about 1s. 6d. per cwt; this has since been recovered, and the month closes firm for beet at 23s. 3d.—the highest point previously reached.

Most cane kinds have advanced 6d. to 9d. per cwt.

The prices of refined goods are lower all round, owing largely to the heavy imports of foreign refined.

The statistical position is exceedingly strong, and point to still higher prices. The stocks in this country and in the United States are some 2,000,000 tons less than they were a year ago. If we take the American imports of sugar from 1st May to 31st December, 1888, and compare them with the prospect of the supplies for the same period of this year, it would seem almost certain that the United States will be obliged to come to Europe for 150,000 tons to make out her requirements, and this too without increasing her stocks, which at present do not amount to a week's consumption.

The imports of foreign refined for April were 38,502 tons, against 35,348 for April, 1888; and for the four months, 148,834 tons, against 94,928 tons for the corresponding period of 1888, or an increase of 54,006 tons, made up as follows: Germany and Austria, 33,568 tons; Russia, 7,472 tons; France, 6,650 tons; Holland, 5,307 tons; Belgium, 1,053 tons; other Countries, 99 tons; on the other hand there is a decrease from the United States of 143 tons.

The deliveries into the United Kingdom (four principal ports) up to 25th May, show an increase of 39,133 tons upon the same period last year, and the imports a decrease of 19,791 tons.

The stocks on 25th May, at the four principal ports of the United Kingdom, were 153,241 tons, which is a decrease, as compared 1888, of 93,057 tons.

Present quotations for the standard qualities, as under, are:—

FLOATING.		Last Month.
Porto Rico, fair to good Refining	19/9 to 21/6 against	19/- to 21/6.
Cuba Centrifugals, 97% polarization	22/- to 22/3	„ 23/-
Cuba, fair to good Refining	20/- to 20/6	„ 19/6 to 20/6.
Java, No. 14 to 15 D.S.	22/9 to 23/3	„ 23/9 to 24/-.
British West India, fair brown.. ..	18/- to 19/6	„ 18/6 to 19/-.
Bahia, low to middling brown	14/6 to 16/-	„ 14/- to 15/6.
„ Nos. 8 to 9	17/3 to 18/-	„ 16/6 to 17/6.
Pernams, regular to superior Americans..	16/6 to 19/-	„ 16/- to 18/-.
LANDED.		Last Month.
Madras Cane Jaggery	12/9 to 13/- against	12/- to 13/-.
Manila Cebu and Ilo Ilo	13/- to 14/-	„ 12/- to 13/-.
Paris Loaves, f.o.b.	24/-	against 24/9 to 25/-.
Russian Crystal, c.i.f.	23/6	„ 24/-
Titlers	26/3	„ 26/-
Tate's Cubes	26/3	„ 27/6
Beetroot, German, 88%, c.o.b.	23/3	„ 22/6

THE SUGAR CANE.

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 The writers alone are responsible for their statements.

N.B.—All communications to be addressed, and Cheques and P.O. Orders made payable to HENRY THORP, Ducie Chambers, 57, Market Street, Manchester.

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It cannot be too widely known that whilst cane sugar and beet sugar *when chemically pure* are identical, they are certainly not so as generally used.

The Sugar Bounties Commission has terminated its labours, and its report has now to be considered by the signatory Powers. None of these Powers, namely, Austria, Belgium, Germany, Great Britain, Italy, the Netherlands, Spain, and Russia, have withdrawn from the Convention of last year; there have not, however, been any accessions to it. The duty assigned to the Commission was to report on laws proposed in these countries for the purpose of giving effect to the Convention. It is stated that various amendments have been suggested; Belgium in particular not being satisfied that German and Austrian laws afford sufficient security against fraud. The work of the Commission is thus not fully completed.

The Duke of Argyll has written an important letter to *The Times* on the Sugar Question—important because it is written not from a partisan's, but from a statesman's point of view. In it he alludes to the attitude taken up by Sir T. H. Farrer on this question. The letter will be found at page 343.

At page 359 we give Mr. Giffen's summary of the principal facts contained in the Parliamentary Report on Sugar recently issued (No. 172, Session 1889). Sir T. H. Farrer, in commenting upon it in *The Times* of June 13th, admits that he does not understand the method adopted in arriving at the amount of bounties, and wishes to see it criticised by experts; which has called forth a letter in elucidation

of the subject, from Mr. George Martineau (see page 351). As we stated last month, time is on our side—the result of these discussions will be to strengthen the hands of the Government when the Sugar Convention Bill comes on again next month.

At page 367, we reproduce from the Parliamentary Report on Sugar, just issued, the Memorandum on Sugar Bounties at present existing in Europe; the figures showing the bounty per cwt., are simply *estimates*, it being impossible to arrive at the exact figures.

The following is a summary of the Memorandum in question:—

In the case of Austria-Hungary a direct bounty is given on exportation, ranging from $1\frac{1}{6}$ cwt. to $2\frac{1}{4}$ cwt., according to polarisation, but in no one year must the bounty paid exceed 5,000,000 florins (say £400,000). This will admit of an export of about 200,000 tons; should the exports exceed this quantity, the bounty per cwt. will, of course, be reduced in proportion. In 1887, the exports of raw refined amounted to 222,836 tons, and in 1886, to 241,731 tons. It is certain that the exports from Austria for the year 1889-90, will exceed 240,000 tons, and this will reduce the average bounty to less than 1.8 per cwt.

In the case of Belgium, according to the new law of 2nd April last, the revenue from sugar is fixed at a minimum of 6,000,000fcs., and if by the granting of bounties it should fall below this minimum, the deficit is to be made up by the manufacturers and refiners.

A long paragraph is given to French bounties, in which the bounty per cwt. is *approximately* put at $\frac{4}{10}$ per cwt.

In Germany, the drawbacks given on exportation are estimated to give a bounty of 1 - per cwt.

In Russia, the present system of levying duties on sugar, it is said, gives no bounty.

The bounty in Holland is stated to be equal, on the whole sugar exported, to nearly $2\frac{1}{2}$ per cwt. The exports in 1887, including sugars imported from Java, amounted to 96,453 tons.

In *The Times* of June 26, is a letter from Mr. Giffen, which will not be very pleasant reading to Sir T. H. Farrer, who in commenting upon the Report to the Board of Trade on "Sugar" declined to accept it as Mr. Giffen's, although signed by him.

Mr. Giffen says in reply to it:—

Permit me to reply shortly to some of the recent observations of Sir Thomas Farrer on my Report to the Board of Trade on "Sugar." Sir Thomas Farrer is well aware that in my official position I could not enter freely into controversy with him, but there are one or two points in his letter, as they affect me personally, on which I feel at liberty to speak.

The first is Sir Thomas Farrer's suggestion that the report is not my "spontaneous" work, and that although my name is put to it, he expressly abstains from calling it mine. Coming from Sir Thomas Farrer the insinuation is peculiarly unfortunate. He knows,

or ought to have known, that the numerous reports to the Board of Trade which bear my name have not only been reports for which I have been completely and absolutely responsible, but that, almost without exception, they have been my personal writing, as much my own personal handiwork as any paper I have read to the Statistical Society. The report in question on "Sugar" professes to be a continuation of a previous report which Sir Thomas Farrer well knew to be my own personal work, and it equally bears internal evidence of having been prepared the same way. That some parts are disagreeable to him I can well believe, but that is no reason for his insinuation that reports which I sign are not my own.

I may be allowed to add that I have a strong opinion that reports of the kind I have made in my official capacity should, as a rule, be the personal work of those who sign them. Much of their value depends upon that quality, as a study of their contents will show.

In respect to bounties he says:—

The second point is as to the calculations of the bounty on sugar contained in the report, which Sir Thomas Farrer regards as something novel and unintelligible. So far from being novel, what is said in the report is merely a continuation of the language I have always used with reference to bounties, ever since I gave evidence before the Sugar Bounties Committee of 1880. It is also in accordance with the mode of calculating the bounties which everybody who knows the subject—except Sir Thomas Farrer—has followed. I must conclude from what Sir Thomas Farrer writes now that he has never understood the calculations.

* * * * *

The effective bonus on production must be a sum equal to the whole amount of money which the Government loses, under the conditions stated in my report, viz., that there is an effective market for the non-surplus sugar at home, and for the surplus sugar, or a part of it, abroad; and whether it should be called a bounty on export is very much a matter of language. I have most carefully indicated in the report that in my own opinion the effective bounty is a sum equal to the whole duty which the excess sugar escapes, divided by the whole production, the bounty being, in effect, a bounty on production, made effective by a drawback on export.

In my report, also, I endeavoured to give the necessary *data* for all the calculations; and if Sir Thomas Farrer can get anybody to agree with him that the "pull" of the excess sugar and the money loss to foreign Governments thereby is what he states, he has all the materials for arguing the matter. Writing impartially, however, I was bound to give the *data* for the usual calculations, though it did not occur to me to provide calculations specially for so peculiar a calculation as Sir Thomas Farrer makes.

The part we have omitted speaks of the method of ascertaining the bounty, which is gone into more fully, though the same in substance, by Mr. Martineau in his letter given elsewhere.

The following letter from Mr. James Duncan, in answer to Sir T. H. Farrer, appears in *The Times* of June 19. In it, Mr. Duncan

makes the important statement that 88% beet can be produced in England at 13/- cwt., leaving a handsome profit, which is not half the price it is realizing at the present time (June 28th),—but so long as bounties continue, there is no security for the investment of capital in such an industry in this country :—

Sir,—In the letter to *The Times* of Sir Thomas Farrer on the 13th, I notice he cannot understand why France with such a heavy bounty should export so little. I think I can supply the reason. If the French Government would guarantee the present bounty for 20 years the production and export would increase enormously; but France may diminish the bounty, and in the event of a failure in the Convention, Germany may increase the bounty in consequence. Until the question is settled capital will not flow into the production of sugar. The price of sugar is now very high; but I hear of no extensions in the growth of sugar, except in beet, which is estimated at 10 per cent. increase. The present price of actual 88° beet is 23s.; but 88° beet sugar could be grown at a handsome profit in England for 13s.

I have not noticed in any of the letters on the sugar question the fact that Austria has adopted the system proposed in the Convention, of working in bond, and, in the meantime, has voted some millions of florins to be paid as an actual bounty on the sugar exported. This is certainly straightforward, and a decided improvement on the old plan.

Yours truly,
JAMES DUNCAN, Chairman,
British Sugar Refiners' Association.

9, Mincing Lane, London, E.C.

The shares of the London Produce Clearing House, Limited, upon which £2 10s. has been paid, are now quoted at from £6 15s. to £7 5s., which can only be accounted for by the prospect of great things to come. According to the balance sheet just issued, the net profits to April 30th last are £5742 4s. 8d., which is not five per cent. upon the paid-up capital. The transactions have hitherto been confined to coffee and sugar; tea is now being added; nitrate of soda, it is said, is to follow soon, and wheat and other cereals will presently be embraced in its programme.

According to the *Kölnischer Zeitung*, representatives from England, Germany, France, Belgium, and Russia have arranged to meet in Brussels, at the end of June, to carry out the project of a group of English capitalists for the establishment of a Sugar Bank, with a capital of 60 millions (£3,000,000). The bank is intended simply to act as intermediary, business for own account being excluded, and will establish branches in the countries named. The company is to have its head office in London.

Mr. Howard, one of the persons alleged to be implicated in the New York Electric Sugar Swindle, has been found guilty of grand larceny, and has been sentenced to nine years and eight months in a State prison. The recorder denied the motion for a new trial on the ground that the verdict was contrary to law and against the evidence, and on account of error in the charge of the Court to the jury. The recorder in passing sentence said: "A greater fraud was never brought to my notice, you are a perjurer and a hypocrite. You went on the witness stand and perjured yourself over and over again."

We have received from the author, Mr. W. Herbertz, the able editor of the *Deutsche Zuckerindustrie*, a pamphlet of 28 pages, entitled "Die Zuckerconvention vom 30 August, 1888," and have pleasure in recommending it to such of our readers as are conversant with German. It contains a well-digested *résumé* of the history of Sugar Bounties in Europe, and of the previous attempts at united action in regard to this question and the causes of their failure; but the best feature of this little publication is the discussion, in pages 12 to 19, of the consideration whether or not the abstention of those countries which at present decline to join the Convention will stand in the way of its attaining its object, *i.e.*, the abolition of the bounties. The writer gives copious facts and figures in support of his conclusion that the ultimate refusal of the countries (including Brazil, the United States, and France) which at present stand aloof, need not materially affect the success of the Convention. The substance of the remainder of the pamphlet, arguing that the abolition of premiums would have no sensible effect on the prices of sugar, has already appeared in our June number, pp. 290-292.

The advocates of the diffusion process, as applied to cane, are sanguine of success; and, certainly, the most recent experiments made with it go a long way to justify them in being so. At pages 353-358, and at page 371, we give some results obtained in British Guiana, the Hawaiian Islands, New South Wales, and Louisiana. The expenditure in coal, which at first seemed a great obstacle, has been very considerably reduced.

What we are anxious to see is a balance sheet, and a profit and loss account for a season's crop, where *all* the different items of expenditure and of receipts are shown, also the capital invested. Our planters will then, and not until then, be able to decide whether it is better to continue with their present crushing system, or to throw their mill

plant at one side, treating it as old metal and material, and adopt the diffusion process.

We understand that the Sangerhäuser Machine Company have just contracted for a complete diffusion plant to work up 400 tons of cane in 24 hours, for Cuba.

They have also received the following report from Mr. Daniel Thompson, of Calumet Plantation, Louisiana:—

“Regarding the five Kroog filter presses received from you in 1887, I may state that they have given me entire satisfaction. I have had no trouble in working them, and feel assured that their use has increased the amount of sugar made by me at least ten pounds per ton (2,000lbs.), which much more than pays for their entire cost, the first season they were used.”

The following results obtained during the campaign, 1888-89, by German and other sugar factories have been announced since our notice of last month:—

Klützow (capital, M. 885,000), net profit, M. 163,778; *Dettum* (capital M. 300,000), net profit, M. 133,194; *Rostock* (capital, M. 600,000), net profit, M. 117,588; *Algermissen* (capital, M. 450,000), net profit, M. 76,003; *Weissenfels* (capital, M. 225,000, and a similar amount on mortgage), net profit, M. 43,579; *Hoiersdorf* (capital, M. 297,000), net profit, M. 30,186; *Aderstedt* (capital, M. 989,625), net profit, M. 8,837; *Hasede Förste* (capital, M. 272,700, and a preference loan of M. 455,000), a slight loss of M. 81, after writing off M. 27,254 for depreciation. (The amount written off, before the net profit or loss is ascertained, is usually 10%).

Dividends declared:—*Thiede* (capital, M. 360,000), 10%; *Lippe* (capital, M. 625,000), 7%; *Körbisdorf*, 5%, besides putting aside M. 50,000 for new buildings.

The factory at *Camburg* is to be considerably enlarged to meet the wishes of the farmers of the district, and will be able to work up 600 to 750 tons of beets daily.

The *Hollandsche Suikerraffinaderij*, of Amsterdam, refined 22,000 tons of raw sugar in 1888, and declares a dividend of 4%.

The Union of Danish sugar manufactories pays a dividend of 5%.

The *Mödritz* factory (Bohemia) declares a dividend of 6%; last year no dividend was paid.

In Hungary a new factory is to be set up at *Szerencs*, with a capital of fl. 1,550,000 (£129,000), which will be the largest in that kingdom. The erection of another at *Apez-Santo* is being considered.

THE DUKE OF ARGYLL ON THE SUGAR CONVENTION BILL.

The following letter from the Duke of Argyll on the Sugar Bill is taken from *The Times* of June 5th. It will be seen that the Duke is not in agreement either with Lord Bramwell or Sir Thomas H. Farrer on this question:—

Sir,—The Sugar Bounties Convention Bill is very far from being a measure of first-rate political importance; but the arguments used on both sides concerning it range over a very wide field indeed, and they do involve principles of the highest interest. They fall under two very different categories—one set of arguments resting on what are called the doctrines of free trade, and another set resting on the practical difficulties or risks arising out of our treaty relations with other Governments. I do not now address you for the purpose of expressing any decided opinion on this last class of arguments; they have been urged with conspicuous ability by Sir Thomas Farrer, as well as by many others. The inconveniences which may possibly arise from binding ourselves in any way whatever respecting our own fiscal policy by special engagements contracted with foreign Governments are so obvious that, in the abstract, they afford a strong ground for warning and a safe ground for objection. They applied to and were used against the Cobden commercial treaty with France; and I have a vivid recollection of the scorn with which old and staunch free traders treated the plea which some of us used at that time, that the great apostle of free trade was himself the negotiator of that Treaty. In particular I remember the strong objections urged against it by the late Lord Taunton—one of those few men whose incorruptible integrity of mind made him instinctively revolt against departures from what he accepted as a principle in deference to personal authority—or, still more, in deference to party convenience. There is no Vatican in politics. There is no authority in the interpretation of natural laws and of accepted truths; but the question may always be raised in such cases whether the assumed law has been accurately defined and properly understood. The antecedent objections which lie against all “entangling engagements” with foreign States have no exclusive reference to fiscal policy. These objections apply equally to such engagements respecting territory, respecting armaments, respecting the protection of special religions, and respecting many other subjects which have often been made

matters of international stipulation. Self-imposed restrictions or obligations of this kind touching fiscal policy may or may not be objectionable, according to the circumstances of each case, without the objections, real or alleged, being in the least degree affected by the true doctrine of free trade. That doctrine does not assert that all commodities shall be "free" from duties; neither does it assert that no such duties can ever be regulated by mutual agreements. What it does assert is that duties on commodities should never be imposed for the purposes of "protection." What it does deny is that Governments should impose duties or expend taxes for the purpose of raising or lowering the value of particular commodities or the produce of particular industries. In short it asserts the general principle that governments should never attempt to regulate the price of anything, and that all attempts to do so are mischievous delusions. If international agreements and stipulations, therefore, are aimed at the practical application of this general doctrine all over the world, they may be open to objections coming from another quarter, but they are certainly not under any ban from the principles of free trade. On the contrary, they are conceived in the spirit and in the interest of those principles. This was the instinct and the idea which inspired Cobden when he negotiated the French treaty. It was open to many objections. It bound our hands where it might be convenient they should be free. It put us in the position of helping a personal ruler to circumvent his own people and his own Parliament. It was unpleasant in several other ways; but such fiscal changes as it provided for were all in the direction of free trade. Cobden did not interpret that doctrine in a provincial spirit. He knew that it embraced the world. Nay, more, he knew that its blessings would never be secured until the world was actually embraced within its practical applications. The last speech I ever heard from John Bright—addressed to an American audience in London on a late celebration of the Fourth of July—was a speech full of the same spirit. It was in him, as in Cobden, truly cosmopolitan. Everywhere, and in all lands, he wished and longed to see the abolition of all duties and fiscal regulations aimed at the restraint or at the inflation of trade by artificial interferences with price. Devotion to one idea may or may not be a safe thing in dealing with practical affairs; but at least we can recognise it and honour it when we see it. But not less securely ought we to recognise its counterfeits when we see them. The misconception, the misstatement, and the

misapplication of a great principle is not only an obnoxious but a most mischievous thing.

Such, in my opinion, are those denunciations of the Sugar Convention which pretend to condemn it as contravening the doctrines of free trade. I can understand the line taken by Lord Bramwell. It has been explained and defended with characteristic force and clearness. His language has been something to this effect:—"It is true that bounties are bad policy; but the badness affects only those who give them. The French are great fools for giving bounties to their growers of beet. It is a policy which all free trade doctrines absolutely condemn. But what is that to us? They are given in France, not in England. The French people get all the loss, and we get all the benefit. Let us be free to benefit by these fallacious doctrines of protection, Cheapness is obtained by us—never mind by what means; that is not our business. Let us mind ourselves. Let us accept what is in itself a boon, and think nothing of the damage it may inflict on other people." This is plain speaking; but the doctrine taught is not glorious. In so far as it represents anything of an idea at all, that idea seems to be that mere cheapness, wholly irrespective of its causes, is itself always a blessing. This is not an uncommon idea. With many people it represents all they think and all they care about in what they call free trade. It is an idea which is demonstrably erroneous. We are just emerging from a period of prolonged cheapness in almost everything. Yet all the world has been calling it a period of "depression"—a period of widespread loss and suffering. The return of comparative dearness is universally hailed as the dawn of a returning day. This is a fact, whatever may be its explanation. And perhaps the only possible explanation might cast some light on certain fashionable tenets of political economy. But, whatever it be, the doctrines of free trade are not to be made responsible for so gross a fallacy. If it be true that some home industries are really resting on a cheapness of sugar artificially created by bounties, no genuine freetrader would encourage them to trust in that cheapness. He would tell them that they were building their house upon the sand; he would warn them that such cheapness must be essentially precarious—not only held at the mercy of foreign Governments, but at the mercy of a continued blindness on their part to their own interests, which some day is quite sure to be removed.

But then comes (in a recent speech) Sir Thomas Farrer, mounted

on a very high horse indeed. He leaves the humbler argument of practical difficulties, on which truth and soberness give him a good deal to say, and on which perhaps political antagonism suggests to him a good deal more. Not content with such objections, he ascends the heights of dogma, wields the language of authoritative orthodoxy, praises those who are "thoroughly sound on the vital question of free trade," and talks about "real believers" in free trade principles, all of whom are warned against "covert and insidious attacks" against the sacred doctrine. Under the threat of such formidable anathemas we look for samples that may furnish an explanation. Three such samples are given. They are—1st, the Revenue Act; 2nd, the Merchandise Marks Act; and 3rd, the Cattle Plague Act. I am not sure of what is meant by the first of these; but the two remaining Acts give a very clear idea of the conception which is to be enforced as of Divine right in the science of economics. Cheapness of commodities, however obtained, however temporary, however dangerous, however precarious—this is the ideal we are to worship. Against this high ideal an Act to keep out disease is a deadly sin. An Act against fraudulent marks on goods is another unpardonable iniquity. I have heard Macaulay say, "No man is in favour of free trade in cab fares." Of this I am not quite sure. But the man who favours the free import of disease and the free passage of forgeries and of frauds must be a fanatic indeed. I agree with Sir Thomas Farrer that the real doctrines of free trade are not wholly safe. Almost all nations, except ourselves disbelieve in them. The immediate and visible advantage of large bodies of men in all nations are in conflict with them. The limitations on the truth of them are near and obvious. The virtue of them lies in wide generalizations which it is not always easy to grasp, to explain, and to enforce. Powerful classes are under continual temptation to revolt against them. The impression, widely prevalent, that the doctrines of protection have or ever had any special connection with the agricultural interest is a delusion born of a contest still recent, and comes as the echo of voices which are not yet forgotten; but it is a delusion none the less. Protection began among the commercial classes, and was enforced by them and for them with passionate conviction. There is hardly one single great industry in our country which has not been hatched and fledged in the nurseries of protection. The same thing is true of what are called the working classes. The genius of Watt would have been stifled if the "hammermen" of Glasgow had had their way.

Our cities and our boroughs have risen, and many of them have thriven, on early systems of privilege and monopoly. In fact it may be said with truth that no great interest or class has ever seen the virtues of free trade until they had become quite obviously conducive to its own advantage. And now, even in our own country, wherever this advantage is not apparent, the sails of free trade may be seen flapping in the wind. Protection in its grossest form—the open attempt to regulate prices by the State—with all its train of logical fallacies and of mischievous effects, is the favourite resource of men who set up as the great authorities on the doctrines of free trade pure and undefiled. With such an example set before every interest and every class, protectionism will be in danger of rising again on every side, wherever some immediate profit is to be secured, either political or economic, and wherever accompanying evils, however certain and however great, are just a little more remote. Moreover this danger will be intensified unless the real doctrines of free trade are held and taught with circumspection and with care. If mere cheapness, whatever be its cause, and whatever be its incidents, is held up as the one sole aim and object of economic action—then adverse intellectual convictions will be as powerful against free trade as adverse special interests. Those doctrines will never stand discussion which denounce as “insidious schemes” against free trade measures taken to defend our herds from murrain, and our merchants or our people from forgery and fraud.

Your obedient servant,

ARGYLL.

To this letter Sir Thomas H. Farrer writes in reply for chapter and verse, for the statement said to be made by him:—

Sir,—I hope you will allow me to ask the Duke of Argyll where, either in your columns or elsewhere, I have anathematized either the Revenue Acts, the Merchandise Marks Act, or the Cattle Plague Act, or where I have set up “temporary, dangerous, and precarious cheapness” as an “idol to worship.” That I have spoken of the Sugar Convention and the Sugar Bill as a “covert and insidious attack on free trade,” in the interest of West Indian planters and British sugar refiners, is true in the spirit, if not in the letter; and it will take more than his Grace’s declamations to displace my arguments.

Your obedient servant,

T. H. FARRER.

Abinger Hall, Dorkin, June 5.

To Sir Thomas H. Farrer's enquiry, the Duke of Argyll sends the following courteous reply :—

Sir,—Sir Thomas Farrer asks me in your paper of to-day “where, either in your columns or elsewhere, he has anathematized either the Revenue Acts, the Merchandise Marks Act, or the Cattle Plague Act,” in terms answering to my description in my letter to you published yesterday.

My reply is that I took the description of Sir T. Farrer's language from a report in your columns of (I think) May 15th, of a speech delivered by Sir Thomas at “a meeting called by the London Liberal and Radical Union,” held at St. James's Hall.

I shall be very glad to hear that the declamatory and illogical observations ascribed to Sir Thomas in that report were not really delivered. But I adhere to the description I have given of them as perfectly fair. In particular, he is reported to have specified the three Acts above mentioned as examples of “covert and insidious schemes” more “dangerous to free trade” than the “open attacks of the fair-traders.”

All the other phrases, and names, and descriptions quoted by me as authoritative and dogmatic on the bearings of free trade are taken from the same report.

Your obedient servant,

ARGYLL.

Danbury Palace, Chelmsford, June 6.

It appears that the Duke of Argyll was in error in attributing the remarks made by Sir T. H. Farrer, to a *speech* at a meeting called by “The London Liberal and Radical Union,” as will be seen by Sir T. H. Farrer's rejoinder in *The Times* of June 10th :—

Sir,—In his letter in your number of to-day, the Duke of Argyll fails to point out where I have set up “cheapness of commodities, however obtained, however temporary, however dangerous, as an ideal to worship,” and I challenge him to do so. As regards my alleged anathemas of the Revenue Acts, the Merchandise Acts, and the Cattle Plague Acts, I have found the passage to which the Duke of Argyll refers.

It was not in a speech at St. James's Hall, as his Grace incorrectly states, for I was not present, but in a letter to Sir W. Harcourt, which he read to the meeting.

It was as follows:—

The third lesson to be drawn (from this sugar story) is that the danger to free trade does not lie in open attacks such as these of the fair traders; it lies in covert and insidious schemes disguised under names and objects which are in themselves innocent—the Revenue Act, the Merchandise Marks Act, the Cattle Plague Act, or, as in this case, in a perverted appeal to free trade itself.

If his Grace had read the passage with common care he would have seen that, so far from anathematizing these Acts, my meaning was to point out that these innocent and useful measures, and even free trade, with which I coupled them, might easily be used to cover insidious schemes of protection. And if, as he implies in his letter, he has read what I have written on this subject, he would have known that one of my chief topics has been the absurdity of making the innocent and useful Merchandise Marks Act a precedent for boycotting sugar from France and other bounty-giving countries.

But I am afraid his Grace's reading of what has been written on this subject has, like his reading of your report of the St. James's Hall meeting, been a little superficial.

Your obedient servant,

Abinger Hall, Dorking, June 7th.

T. H. FARRER.

And to this letter the Duke of Argyll replies as follows:—

Sir,—Sir Thomas Farrer challenges me to point out where he has “set up” cheapness, however obtained, &c., as an ideal of worship.

I respond at once to this challenge. If by “setting up” Sir Thomas means expressing in distinct words the doctrine or ideal referred to, he probably has never done so, and I have nowhere alleged that he has done so. Doctrines or preconceptions of this kind are very rarely put into distinct words; but it is the commonest thing in the world to see men using arguments which involve and wholly rest upon such preconceptions, although they are never avowed, and are not, perhaps, even consciously entertained. It is the business of sounder reasoning to drag out into the light of day these underlying assumptions and to put them into definite form. Of course, those who have themselves been deceived by them never recognize them as what they said, or what they meant. In this case I had no difficulty. Lord Bramwell's language is always plain and unambiguous. He laughs at the idea of sacrificing cheapness because it may be due to bounties. Yet even in his case I have not

represented him as avowing the broad doctrine as I have expressed it. I do not know whether he would avow it or not. All I do know is that it underlies his whole argument, whether it is consciously entertained or not. This is the view of it which I presented in my letter, and no other. I included Sir Thomas Farrer's arguments and language expressly, along with all other "denunciations of the Sugar Convention which pretend to condemn it as contravening the doctrines of free trade." I adhere to this contention. Bounties are the very worst of all fiscal follies according to the doctrines of free trade. The endeavour to persuade all other nations of this folly is the duty of all free-traders. To denounce it as Sir T. Farrer does, as contrary to "light and knowledge" on the true doctrines of free trade is, in my view, fallacious and paradoxical. To talk of those who do not agree with him in this paradox as "not real believers in free-trade principles," as not thoroughly "sound" on the vital question of free trade, and as men who have "surrendered their faith," and so on, seems to me to be simply what our American cousins call "tall talk," without justification and almost without meaning.

I am very glad to find that Sir T. Farrer did not intend to denounce the Merchandise Marks Act or the Cattle Plague Act as "insidious schemes" of a like character. But his language about them (which I now find was written and not merely spoken) was so ambiguous, or so imperfectly reported, that the meaning I assigned to it was the natural one.

In conclusion, let me say that the abolition of the bounty system all over the world seems to be not only a legitimate, but a most important object in the interests of free trade; that if this object can be attained by mutual agreement among different nations, there is no abstract or *à priori* objection against such agreements; but that every such agreement must be judged on its own merits—on the amount of freedom we resign, on the probability of such freedom being ever used, and on the possibilities of collision between previous engagements. All these, again, depend largely on the amount and extent of international agreement which may be secured.

By all means let all these arguments be carefully considered. But do not let us be scared by doctrinaire denunciations which do not seem to be even orthodox on the tenets which they pretend to enforce.

Your obedient servant,

Danbury Palace, Chelmsford, June 9th.

ARGYLL.

THE AMOUNT OF THE BOUNTIES.

SIR THOMAS FARRER ASKS FOR INFORMATION.

MR. MARTINEAU'S REPLY.

Sir T. H. Farrer, in a letter which appeared simultaneously in *The Times* and *Manchester Guardian* of June 13, comments upon the Parliamentary Return on the Sugar Trade, signed by Mr. Giffen; and the latter paper has a leader on the letter, in which it says:—"Sir Thomas Farrer frankly confesses that he does not understand that part of the Report, in which various attempts are made to arrive at an estimate of the sums expended by foreign governments on bounties on exported sugar. Neither do we, for which reason we made no reference to it in our extract."

Mr. Martineau, whose intimate and accurate knowledge of the whole bounty system as it relates to sugar, is well known, writes to the *Manchester Guardian* in elucidation of the subject, as follows:—

Sir,—The difficulty experienced in understanding the details of the bounties is natural and pardonable in your case, though not in that of Sir Thomas Farrer, who 'professes' the subject, and ought, therefore, to make himself master of its intricacies. The matters which you are unable to comprehend are easily explained.

The French beetroot sugar manufacturers have been permitted since the law of 1884 to produce much more sugar than they pay excise on; in other words, to pay less than the full duty. But when they export they receive a return of the full amount of duty. They, therefore, export all that they produce over and above the quantity required for home consumption, and secure a handsome bounty in the form of excessive drawback. But this is not by any means the limit of their bounty. The fact of there being this ready and lucrative outlet for surplus production enables them to obtain the full amount of duty on the portion which they sell for home consumption. It is manifest that this must be the case, seeing that the consumer has no means of procuring sugar from elsewhere without paying the full duty upon it. It is true that the same rebate is allowed on sugar imported from French colonies; but as the quantity so imported is only a small portion of the total consumption of France, it is clear that the colonial producer is also able to charge the full duty on his

sugar, though he has not paid it. The rebate is intended to go into his pocket to put him on a par with the home producer, who, in his turn, receives a deliberate and intentional bounty to enable him to compete with his German, Austrian, and other bounty-fed rivals. The bounty, therefore, is not only on the quantity exported, but also on the quantity retained for home consumption.

These are facts well known to all those conversant with the details of the Continental sugar trade, and are sufficiently confirmed by the repeated official statements in the French Chambers and elsewhere of the amount of revenue lost through this bounty. It is clear that were there no bounty on the quantity exported there would be no means of obtaining the bounty on the quantity consumed. It is equally clear that the total bounty obtained on the whole production is the measure of the artificial stimulus to over-production, and of the injury thereby inflicted not only on producers who receive no bounty but still more on consumers throughout the world, who must eventually lose the natural sources of supply, and are even now becoming so dependent on bounty-fed sources that they are paying an advance of more than 100 per cent. on the prices of last October, simply because there is not enough cane sugar to carry us through the summer till the time when a fresh beetroot crop again smashes the market. It is immaterial, therefore, whether the French bounty be described as so much per ton of sugar produced or so much per ton of sugar exported. The fact remains that it is the total bounty which goes into the pockets of the French producers, and that it could not get there unless there were a bounty on the exports. The reason why this enormous bounty now given in France has not resulted in larger exports from France than from Germany is because the bounty was only created in 1884, and it takes some years for the industry to adapt itself to the new *régime* by growing richer roots and improving the manufacturing processes, so as to produce the excess yield by which alone the bounty is to be secured. It also takes time to extend the cultivation, and there is not the same scope for extension in France that there is in Germany. In Germany, on the other hand, the bounty to the producer (as distinguished from the refiner) has been going on for a long series of years, and has resulted in an increase of the German annual production from two to three hundred thousand tons to more than a million.

The discrepancy between the figures quoted by Baron de

Worms, as representing the amount of the Continental bounties, and those given by Mr. Giffen is easily accounted for. Changes have recently taken place in the legislation of several of the bounty-giving countries, and these changes—some very recent—have been taken account of by Mr. Giffen in making his calculations. Baron de Worms, on the other hand, could only have recourse to the most recently published statement, which was that of Herr Herbertz, editor of the *Deutsche Zuckerindustrie*, than whom there could not be any more competent or reliable authority. Representatives of British sugar industries might have been suspected of bias if they had ventured to furnish the Government with their own estimates, and therefore Baron de Worms was fortunate in procuring the figures of an eminent German statistician who could not be accused of exaggeration. As to the French bounty there is ample proof in the annual official figures.

I am, &c.,

GEORGE MARTINEAU, Hon. Sec. British
Sugar Refiners' Committee.

21, Mincing Lane, 15th June, 1889.

BRITISH GUIANA.

DIFFUSION PROCESS AT NONPAREIL PLANTATION, 1888-89.

The Sangarhausen Machine Company kindly furnish us with the following particulars of work done on the Nonpareil Estate by the diffusion process in 1888-89, compared with the work done by crushing on the same estate and during the same period of time for 1887-88.

The Diffusion Battery at Plantation Nonpareil was started for taking off the last year's crop on September 19th, 1888, and worked without interruption until the 19th January, 1889, during which period 26,145 English tons of sugar cane were worked up by the Diffusion Process.

The results of this long run, to which visitors were kindly admitted every week once by the proprietor of the plantation, Mr. Quintin Hogg, have been found sufficient to convince the Demerara planters of the high superiority of the Diffusion Process even over the best crushing, which had ever been done with mills, and we succeeded in securing orders for Diffusion plants, to replace the mills at two other plantations in Demerara, "Belair" and "Reliance."

“Belair” being one of the largest Estates in that Colony, will have two Diffusion Batteries of a capacity of 300 tons cane per day each.

The following comparative tables, which are most accurately made up by a qualified chemist, who is being employed by the owner of Plantation Nonpareil, show what has been done before with “double crushing” in two powerful three-roller mills, and what was the result in the following year, when the cane was worked up by the “Diffusion Process” :—

	MILL WORK from 27th Oct. 1887, to 28th Jan., 1888 (Juice expressed on weight of cane, 70·4 per cent).	DIFFUSION WORK from 19th Sept., 1888, to 19th Jan., 1889.
Sucrose in sugar cane	14·731 = 100·000 ..	13·041 = 100·000
„ masse-cuite	10·962 = 74·704 ..	11·749 = 90·092
Loss of sucrose in megass	2·995 = 20·331 ..	0·823 = 6·318
Unknown loss of sucrose	0·774 = 5·255 ..	0·469 = 3·590
Total loss of sucrose	3·769 = 25·586 ..	1·292 = 9·908
Sucrose in molasses and 2nd sugar..	3·756 = 25·497 ..	2·958 = 22·682
„ 1st sugar	7·206 = 48·917 ..	8·791 = 67·410

8·791 is chemically pure sugar, whereas the 1st production of sugar averaged 96·4 per cent. polarisation. Therefore $\frac{8·791 \times 100}{96·4} = 9·119$ per cent. 1st production sugar were actually obtained on the weight of cane by the Diffusion Process.

The best results were obtained by Diffusion during the last part of the season, when the attendants who were in charge of the diffusion machinery had become more familiar with the new system.

The following is an average of the Diffusion work from 3rd December, 1888, to 19th January, 1889 :—

Tons of cane diffused	9,622·908
Per cent sucrose in cane	12·878
„ „ cane juice	14·631
„ total solids in cane juice	17·838
Quotient of purity of cane juice	82·010
Per cent. sucrose in diffusion juice	11·117
„ total solids in diffusion juice	13·612
Quotient of purity of diffusion juice	81·670
Per cent. sucrose lost in exhausted cane slices....	0·498
„ dilution of diffusion juice	23·664
Tons masse cuite obtained	1,510·130
Per cent. masse cuite on weight of cane	15·693
Tons 1st sugar obtained	894·292

Per cent. 1st sugar on weight of cane	9.293
Average polarisation of 1st Sugar	96.367
Tons of coal burned	1,079.250
„ „ „ „ per ton of 1st sugar	1.207

The coal consumption at Plantation Nonpareil amounted to 14 cwts per ton of 1st sugar formerly, when the cane was worked up by double crushing in mills. Sugar factories, working with mills and burning less coal, will of course burn less coal with diffusion in the same proportion, and we may mention here that Plantation Kealia, in the Hawaiian Islands, where a diffusion plant—also supplied by us—of same size and construction as the Nonpareil plant, is at work, has so far succeeded to reduce the coal consumption to one sixth of a ton per ton of dry sugar. The exhausted cane slices, after being passed through one of the old three-roller mills, burned readily in our “ladder grate furnaces” and gave an excellent fuel; 320 tons of sugar cane per day of 24 hours afforded fuel for four steam boilers of a total heating surface of 3,320 square feet, these boilers being worked at a steam pressure of 60 pounds per square inch.

HAWAIIAN ISLANDS.

DIFFUSION PROCESS AT KEALIA, HAWAIIAN ISLANDS.

Colonel Z. S. Spalding, president of the Makee Sugar Company, Kealia, Hawaiian Islands, writes as follows:—

New York, May 3rd, 1889.

Mr. Ernst Schulze, Agent Actien Maschinenfabrik of Sangerhausen, Germany.

Dear Sir,

I am sorry that limited time prevents my expressing upon paper the satisfactory results I have this season from the diffusion battery furnished by your company.

As soon as the season is completed I will have figures, showing results, sent to you; at present I will confine myself to simply saying that,

1st. We are working up an average of 300 tons of cane per day, making an average of 42 to 45 tons of dry sugar, of quality fully equal to any made by mill process.

2nd. We do all liming in the battery, and do not use clarifiers or cleaning pans.

3rd. without changing our furnaces, and with more exhaust steam than we can use, we find one sixth ($\frac{1}{6}$) of a ton of coal to each ton of dry sugar sufficient extra fuel beyond the cane chips. These chips are dried by passing through the old cane mill and air-dryer.

4th. By the use of molasses in the cells we are enabled to take off the juice from the Battery at higher density than the normal condition of the juice in the cane. This has not been carried to perfection as yet, but promises to be a great feature in diffusion. When our experiments (as regards using molasses in the diffusion cells) are complete, I will give the results to the world.

In a word, no planter is rich enough to do without diffusion!

I am, yours truly,

(Signed) Z. S. SPALDING,

President Makee Sugar Co., Kealia, Hawaiian Islands.

(At Kealia the cane juice averaged during the last season 11.5deg. Beaumé.)

NEW SOUTH WALES.

DIFFUSION PROCESS OF TWEED RIVER.

Mr. Fritz Pfeiffer, chemist of Plantation Cugden, Australia, writes to the Sangerhauser Machine Company as follows:—

Plantation Cugden, Tweed River, January 31st, 1889.

Dear Sirs,

First of all I beg to inform you that the machinery and apparatus furnished by you have all given complete satisfaction, and that we are going to turn out the quantity guaranteed as soon as we shall have altered our water supply system.

During the whole campaign, that is to say for three months, we had no rain whatever, and even before that period the fall had been under the average.

You will be astonished at the figures, but owing to the size of our plant we were too short of water to be able to do better. Out of 24 hours we worked only 10 or 12 hours, and after adding one third per cent. of lime we left the chips until next day. Wonderfully enough, the juices hardly underwent any change in the cells, though the proportion of cane sugar in them diminished by 2 per cent. between the stoppage and the start the following day.

The juice from the exhausted chips polarised 0.20 to 0.32 per cent.

of sugar; but if previously saturated with carbonic acid it showed 1.75 to 1.90 per cent.

It is evident from this that any excess of CaO will keep the sugar bound to the chips, so that is preferable to add 0.7 to 0.9 per cent. of CaCO_3 to the chips. The juices kept then perfectly well for 18 hours without undergoing any change. Our apparatus for making CaCO_3 was, however, so important, that we often could not furnish a sufficient quantity.

I have also worked experimentally, but on a larger scale, direct from the battery into the triple effet.

There was no difficulty, and the juices showed such trifling residues, that I came to the conclusion that you may work that way for a week without needing to clean the triple effet.

The following are two analyses of thick juices, viz.:—

- (a) Juice obtained in adding 0.7 per cent. of CaCO_3 to weight of cane in cells: Specific gravity, 1.185; brix, 41; cane sugar, 39.28; quotient, 95.8; fruit sugar, 1.68; quotient, 4.09.
- (b) Juice obtained in adding 0.4 per cent. CaO to the juices in clarifiers, the whole being run through filter presses: Specific gravity, 1.182; brix, 40.5; cane sugar, 39.20; quotient, 96.8; fruit sugar, 1.44; quotient, 3.53.

The high polarisation as well as the quotient of cane sugar may be attributable to the presence of raffinose, which is known to react about 1.8 times as much as cane sugar. I should not omit to mention that the thin juice of (a) underwent a detention of eight hours on the way to the triple effet (owing to a stoppage of plant) without showing any deterioration. Upon the whole these figures show that the two juices are of about equal commercial value.

The season now completed shows that our plant has required on the average of the campaign, 9.26 tons of cane for every ton of sugar made, and that ton is produced in the following proportion, viz.:—16.65 cwt. of 95 per cent; 5.35 cwt. of 88 per cent.

In quoting the above figures we count, however, only the first and second product. In addition to the above, there were 5.36 per cent. of molasses and thirds.

Yours truly,

(Signed)

FRITZ PFEIFFER, Chemist.

The following table, made up by Mr. Pfeiffer, will show the work actually done with our diffusion battery at Plantation Cugden:—

DIFFUSION PROCESS IN THE BATTERY IN CUDGEN-SEASON 1888-9.

DATE.	SUGAR CANE.		JUICE FROM FRESH CHIPS.						JUICE DRAWN FROM THE BATTERY.				DILUTION OF JUICE.		Cane Sugar extracted through the Diffusion.	Lost in the Bat-tery.	REMARKS.
	° Cane Sugar.	% of Juice.	Total Solids.	Cane Sugar.	Quotient of Cane Sugar.	Fruit Sugar.	Quotient of Fruit Sugar.	Total Solids.	Cane Sugar.	Quotient of Cane Sugar.	Fruit Sugar.	Quotient of Fruit Sugar.	Cane Juice.	Diffus. Juice.			
Nov. 15-30	15.10	89.4	19.10	16.88	87.0	0.32	1.6	14.2	12.41	87.4	0.26	1.8	100	136	96.4	0.64	Burnt Cane. Small Cane with 5°/o leaves and tops. Want of Water.
Dec. 4-8	13.22	89.0	17.10	14.74	80.2	0.40	2.4	13.2	11.83	85.8	0.29	2.2	100	130	97.9	0.28	
" 9-15	13.64	89.2	17.40	15.29	88.0	0.20	1.6	13.4	11.78	87.9	0.23	1.5	100	130	88.3	0.23	
" 16-22	14.00	88.6	18.60	15.80	85.2	0.56	3.0	13.5	11.61	86.0	0.36	2.7	100	136	96.8	0.46	
" 25-29	13.28	89.8	17.00	14.90	87.5	0.46	2.7	13.0	11.32	87.1	0.41	3.2	100	131	97.1	0.39	
Jan. 2-5	13.02	85.1	18.00	15.00	85.0	0.74	4.1	13.0	10.23	78.4	0.60	4.6	100	149	96.0	0.62	Worked in the Day-shift only.
" 6-11	13.83	89.4	18.14	15.46	84.7	0.67	3.7	13.1	11.38	86.7	0.54	4.1	100	136	94.2	0.79	
" 13-18	14.44	89.4	18.70	16.15	86.2	0.78	4.2	13.7	11.91	86.9	0.57	4.2	100	138	95.8	0.60	
" 20-23	14.03	89.4	18.20	15.69	86.1	0.75	4.1	13.8	11.92	86.5	0.61	4.6	100	131	97.9	0.45	
" 28-31	13.70	87.3	19.00	15.73	82.2	1.40	7.3	13.6	11.31	83.1	0.93	6.9	100	139	93.2	0.94	
Average.	13.92	88.66	18.20	15.61	85.8	0.63	3.46	13.45	11.56	85.9	0.497	3.58	100	135.6	100.0	96.83	0.44

MR. R. GIFFEN ON THE PROGRESS OF THE SUGAR
TRADE.

In a Parliamentary Return just issued, No. 172 of Session 1889 is a summary of the principal facts contained therein, by Mr. R. Giffen, which is as follows:—

1. The increase of the production of sugar, which was noticed as so remarkable in the Report of 1884, has been even more remarkable since. It was stated in 1884 that in 1853, or thereabouts, the total sugar production recorded, according to the Circular of Messrs. Rueb & Ledeboer, was only 1,400,000 tons; in 1878, which was just before the Sugar Bounties' Committee in 1879-80, the total was just over 3,000,000 tons; and in 1882, the last year dealt with in the Report of 1884, it was 3,800,000 tons. The increase to 1878 was 110 per cent. in 25 years, and in the following years from 1878 to 1882 the increase was about 26 per cent. Now it has to be added that since 1882 there has been an increase to 5,500,000 tons in the last complete year, or making certain corrections to 5,200,000 tons, the amount being now nearly four times the total in 1853, when the statistics begin.

2. The increase in production has been in all descriptions of sugar, but principally in beet sugar, which, from being an inconsiderable part of the total production, has come to be nearly equal in importance to cane. While in 1853 the production was over 1,200,000 tons cane to rather less than 200,000 tons beet, the production of beet on the average of 1886-87 was 2,430,000 tons out of an average total of nearly 5,200,000 tons, while the production of cane was 2,750,000 tons. The production of beet has thus increased about 12 times, while cane sugar has little more than doubled, the result being that the two sources of supply are now nearly level with each other.

3. In the last few years the growth has not been so large in beet in proportion to the increase in cane sugar as it was before 1882. The increase in beet between 1880-82 and 1886-87 was 787,000 tons, and in cane, making the correction referred to, it was 586,000 tons. Still the percentage increase in beet in this period is more than in cane.

4. British cane sugar has participated in the increase of cane sugar generally, the comparative figures of Messrs. Rueb and Ledeboer, which omit one or two possessions, showing a total of 261,000 tons in 1853-55, and 531,000 tons in 1886-87—an increase of about 100 per cent. In the more recent period, viz., between 1880-82 and 1886-87 the increase is from 419,000 to 531,000, or about 25 per cent. This latest experience, as regards British cane sugar, is different from the experience for some years before 1880-82, in which British cane sugar maintained its proportion to the total production, the increase in the proportion of beet in that period being at the expense of foreign cane. This period was from about 1868-70 to 1883-85, during which British

cane sugar increased steadily from 300,000 to 558,000 tons maintaining a steady proportion of 12 per cent. to the total production, while the proportion of beet in the total increased from 34 to 49 per cent., and that of foreign cane declined from 54 to 39 per cent.; but the latest experience, as already stated, is different. In 1886-87 the proportion of British cane sugar has declined to 11 per cent., while beet has also fallen back a little, and the proportion of foreign cane has recovered a little.

5. The principal increase in beet since 1882 has been in Germany. In the season 1881-82 German production was about 600,000 tons only, now nearly 1,000,000 tons. There is, however, a general increase, and a specially noteworthy increase in the case of Russia and Poland, from about 260,000 tons in 1881-82 to about 500,000 tons at the latest date to which the Tables are brought down.

6. The countries of the world which are the chief consumers of sugar are, first of all, the United States, which takes, 1,500,000 tons or 29 per cent. of the total; next, the United Kingdom, which takes 1,100,000 tons (rather more at the very latest date, but the present figures are taken a year or two back for comparison) or 21 per cent., these two countries together taking almost exactly half the total.

The European countries altogether take 1,900,000 tons or 36 per cent.; and the rest of the world takes about 700,000 tons or 14 per cent.; Australasia, which increases its consumption rapidly, counting for 110,000 tons or 2 per cent.

7. The increase in the case of each of the United States and the United Kingdom has been from about 400,000 tons to the present figures, the rest of the world having increased from about 600,000 tons to the present figures. The increase in consumption has thus been quite general, and although the United States and United Kingdom are conspicuous for the amounts they take, the rest of the world, including Europe, makes an equally important total.

8. The sources of supply to these different consumers have undergone some changes. The increase of the production of beet has been largely for home consumption and cannot have displaced cane sugar to any large extent, as the total consumption of cane sugar on the Continent cannot have exceeded 400,000 tons in 1853-55, whereas the Continental consumption of sugar as already stated is now 1,900,000 tons. A certain proportion of the beet sugar, now about 700,000 tons in all annually, has, however, overflowed from the chief producing countries of the Continent into the United Kingdom, partially displacing cane sugar there, and has also overflowed into the United States, and there are interesting special changes in the sources of supply to different markets to notice.

9. Thus, raw cane sugar, which was supplied to the United Kingdom in 1877-78 to the extent of 12,550,000 cwts. or nearly 630,000 tons,

had increased to 13,241,000 cwts. or 662,000 tons in 1882-83, but has since declined to 9,877,000 cwts. or 494,000 tons. Raw cane sugar from British possessions in particular has fallen from 5,450,000 cwts. or 272,000 tons in 1877-78, to 3,292,000 cwts. or 165,000 tons in 1886-88. At the same time the supply of beet sugar, both raw and refined, to the United Kingdom, has increased greatly, more than making up for the displacement of raw cane sugar. The total figures are: imports from beet countries in 1877-78 about 6,362,000 cwts. or 318,000 tons; and in 1886-88 the corresponding figures are 13,455,000 cwts. or 673,000 tons. This increase from beet countries is about 355,000 tons, of which 258,000 tons is an absolute increase of our imports altogether and 107,000 tons represent a displacement of cane. There has also been some displacement of refined cane sugar.

10. These figures do not show, of course, a diminution of the production of cane sugar, whether British or foreign, which, as already noticed, has increased, but they show a change of market. The supplies thus displaced, along with a large increase of cane production generally, have been largely absorbed in the United States, whose imports, mainly of cane, have risen from about 200,000 tons in 1853-55 to 243,000 tons in 1863-65, to 700,000 tons in 1873-75, to 1,130,000 tons in 1883-85, and to 1,400,000 tons in 1887. The principal countries which supply the United States are, in the order named, Cuba, British West Indies, and Brazil, from all which countries there is a great increase in recent years. Of late also there has been a largely increased import into the United States from the Sandwich Islands, and in the last four years the imports from European countries (beet sugar) have risen from a nominal figure only to nearly 100,000 tons.

11. A notable difference is observable in the movements of the exports of sugar from and to France, as compared with the United Kingdom since the passage of the French Sugar Law in 1884. Imports of beet sugar into France have ceased; imports of French Colonial, specially West India sugar, have increased; and, on the other hand, imports of French West India sugar into the United States have diminished, the very opposite thus happening to French West India sugar, as regards France and the United States, to what has happened to British West India sugar, as regards England and the United States.

12. The detailed facts as to the home consumption of the United Kingdom, besides the amount and increase of consumption already noticed, are that, at the reduced prices, the consumption of sugar at the present time (1888) represents a total value (wholesale) of about £16,500,000, or more than one-third the estimated value (wholesale) of the wheat consumption, and that this consumption represents an average of about 73 lbs. per head of the people of the United Kingdom,

subject, however, to the very important qualification that these consumption figures include sugar used in manufacturing biscuits, confectionery, mineral waters, beer, and other articles, which are themselves exported, so that the sugar is not all finally consumed by the people of the United Kingdom. The final consumption of the people of the United Kingdom must be very large, but it is not the same thing as the consumption which is referred to in the above figure of 73 lbs. per head.

13. The reduction in the price of sugar in the period covered by the Tables has been very great—in raw sugar from an average price, including duty, of 42s. 4d. per cwt. in 1855-59 to an average price of 13s. 5d. in 1888, and in refined sugar from an average price, with duty, of 57s. per cwt. in 1855-59 to an average price in 1888 of 17s. 6d. Much of the reduction of price has taken place since 1874, when the duty was abolished, and half the total reduction of price to the consumer in the period may be considered to arise from the abolition of the duty, and half from other causes connected with the supply and demand of the article itself. The net effect is that the people of the United Kingdom pay only about £16,500,000 for the large amount of sugar they now consume annually, whereas seven or eight years ago they paid from £20,000,000 to £24,000,000 for about 25 per cent. less quantity, and even the 8,000,000 cwts., which was all the consumption thirty-five years ago, cost, inclusive of duty, as much as thrice that quantity, which is the present consumption, now does. All this is, of course, subject to the qualification, stated in the preceding paragraph, that the consumption in question is not all the final consumption of the people of the United Kingdom; but in another way the fall of price, being the fall in a raw material used in manufacturing, must be assumed to have stimulated the industries in which the fall has occurred.

14. The annual amount of sugar refined in the United Kingdom, on the basis of last year's figures, may be put at 740,000 tons, employing 4,260 men, or thereabouts, *in the refineries*, which are twenty-six in number. This is exclusive of subsidiary and dependent industries. The capital fixed and floating employed by the refiners, on the basis of an estimate for the district of Greenock only, may be put at £4,250,000, of which £2,700,000 is fixed. The whole margin between the raw and the refined article, calculated upon the difference between the average import price of the raw article, and the average import price of the refined, cannot be put at more than 2s. 9d. per cwt., which would be equal to about £2,000,000 on the whole amount refined in the United Kingdom; and this is believed to be an excessive estimate, the margin in a great deal of the refining being probably much less. These figures show the actual magnitude of the refining business at the present time.

15. The business of late years has also been a declining one. The quantity refined in 1880-81 was estimated on a similar basis to the present at 700,000 tons, employing about 4,450 men *in the refineries*. In 1884 these totals had increased to 816,000 tons and 5,200 men, from which there has been a decline to the present figures amounting to about 10 per cent. in the quantity refined and 20 per cent. in the estimated numbers employed in the refineries. The greater decline in the numbers employed as compared with the decline in the out-turn of refined sugar is ascribed to changes in the character of the refining processes, which require fewer men than the older processes. The business, it is noted, is becoming of a more varied character.

16. The above figures are to some extent based on estimates of a confidential character supplied to the Board of Trade, but as far as the decline in the out-turn of the refineries is concerned they are fully confirmed by the decline in the imports of raw sugar, and increase in the imports of refined sugar in recent years, coupled with a decline in the exports of British refined sugar. The decline in the imports of raw sugar in the five years 1884-88 is 80,000 tons, even a larger decrease having occurred in the interval; the increase in the imports of refined sugar is from an average of 150,000 tons about 1884 to 335,000 tons in 1887-88; and the decline in the exports of British refined is from about 60,000 tons about 1884 to 37,000 tons on the average in the last three years. The principal increase in the imports of refined sugar in the last few years is from Germany, a new import from the United States two or three years ago having ceased. Various details are given in the Report as to the increase of foreign refining business.

17. In 1884 it was noted that the fall in sugar at that time was not greater than in the case of other staple articles, such as tea, wheat, cotton, wool, &c. Since 1884 there is no doubt there has been a special decline in sugar. In 1884 the decline in refined sugar from the 1861 standard, was about $17\frac{1}{2}$ per cent., and in raw sugar $9\frac{3}{4}$ per cent., the decline in the other articles referred to ranging from about 15 to 38 per cent.; but refined sugar now shows a decline of about 55 per cent. from the 1861 standard, and raw sugar 48 per cent, while the decline in other articles ranges from 27 to 42 per cent. only, and is as high as 50 per cent. in the case of one article only. A great rise in the price of sugar is in progress as this Report is being written. From a price of just under 14s. per cwt. in the beginning of 1889 for raw beet, the price has already (24th May) advanced to 22s. 9d. per cwt., a rise of over 60 per cent.

18. With regard to the bounties given by foreign Governments, an explanation is given of the way in which they arise under a system of import and excise duties with drawbacks on export. The duties being levied on an assumed yield of sugar from a certain quantity of

raw material in the form of roots or juice, and the like, or on an assumed yield of refined sugar from a given quantity of raw sugar, and the actual yields being more than the assumed yields, the result is a certain surplus of sugar which escapes duty, and on which, when exported, a drawback is given as if it had paid duty. A table is also added showing the estimated amount of this surplus sugar in the cases of France, Belgium, Germany, and the Netherlands, and the different calculations which may be made as to the bounty thus arising. These calculations show mainly the amount of surplus sugar with the amount lost to the Exchequer by its not paying duty; the amount of the export bounty, multiplying the surplus sugar exported by the drawback, and the rate which these figures would give, dividing the whole loss to the Exchequer by the total production, or the whole drawback on surplus sugar exported by the total production.

19. In the case of France the estimated surplus of sugar escaping duty and receiving drawback if exported is $36\frac{1}{2}$ per cent.; the whole loss to the Exchequer ($200,000$ tons \times £20 per ton the escaped duty) £4,000,000; the drawback on surplus sugar exported ($159,000$ tons \times £20 per ton the drawback paid) £3,180,000: and the rate of the bounty, dividing the total loss to the Exchequer by the total production, £7 4s. per ton, and dividing the total export drawback by the total production, £5 14s. per ton. The latter corresponding figures in the case of Germany are in both cases £1 per ton, in the case of Belgium £3 13s. per ton. In the case of the Netherlands the bounty on production is £4 10s. per ton. There is another mode of calculation, viz., to divide the drawback paid on surplus sugar exported by the whole amount exported; but as the whole surplus is not exported from France, there is in the case of France no difference between the rate thus shown and the rate of the drawback itself. In the case of Germany, which exports more sugar than its surplus, the rate of the bounty on export, dividing the whole drawback paid by the exports, would be £1 12s. per ton, in the case of Belgium £5 per ton, and in the case of the Netherlands £1 14s. per ton. The essential point in all these calculations is the amount of surplus sugar created and the duty which it escapes, whatever may be the calculations as to the amount of the bounty ensuing and the way in which a rate of bounty is to be shown.

20. The increase of the exports from the chief bounty giving countries has already been indicated generally in the above facts as to production, the main point being that while over the whole period reviewed beet production has grown far more than cane, yet cane has itself grown largely, and in the most recent years the growth in cane sugar has still been very considerable. The growth of production and exports in beet countries in the most recent years has not been in proportion to the bounties apparently given at the present moment,

but it is not suggested that the increase of production, which may not be due to bounties, is altogether due to natural causes. Other protectionist measures, it is noticed, such as the levying of import duties without corresponding excise duties, may have contributed to the increase.

I have the honour, &c.,

Board of Trade,

24th May, 1889.

R. GIFFEN.

The contents of the Return in question are as follows:—

- I.—Statement of the Production of Raw Sugar (in Tons) from 1872 to 1887, from the Circular of Messrs. Rueb & Co., formerly Rueb & Ledeboer.
- II.—Summary of the foregoing Statement, distinguishing the Production of Beetroot from Cane Sugar and of British from Foreign Cane Sugar.
- III.—Tables showing the Gross Exports of Sugar from the Principal Beet-producing Countries, in the Years 1868, 1878, 1882, 1886, and 1887; the Imports into the same Countries and the Net Exports:—
 - (A.)—Exports of Sugar.
 - (B.)—Imports of Sugar.
 - (C.)—Net Exports of Sugar.
- IV.—Statement of the Imports of Raw and Refined Sugar into the United Kingdom, distinguishing the Imports from Beet-growing and Cane-growing Countries respectively:—
 - (A.)—Raw Sugar from Cane-growing Countries.
 - (B.)—Raw Sugar from Beet-growing Countries.
 - (C.)—Refined Sugar from Cane-growing Countries.
 - (D.)—Refined Sugar from European (Beet-growing) Countries.

Summary of the foregoing.
- V.—Statement of the Imports of Raw and Refined Sugar into France, and of the Exports of Refined Sugar therefrom.
- VI.—Total Quantities of Raw Sugar Imported into Holland for Home Consumption (Special Trade) from 1872 to 1888, distinguishing Principal Countries from which Imported,
- VII.—Total Quantities of Refined Sugar (Domestic Produce) Exported from Holland from 1872 to 1888, distinguishing Principal Countries to which Exported.
- VIII.—Statement of the Production and Consumption of Sugar in Germany from 1872 to 1877, from the *Statistisches Jahrbuch für das Deutsche Reich*.
- IX.—Statement of the Quantity and Value of Raw and Refined Sugar (Domestic Produce) Exported from Germany in each Year from 1878 to 1887.
- X.—Statement of the Imports of Raw Sugar into the United States from various Foreign Countries in each of the Years ending 30th June, from 1872 to 1887.

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- XI.—Statement of the Imports of Sugar into the Dominion of Canada from various Countries in each of the Years ending 30th June, 1872 to 1888.
- XII.—Statement of the Imports and Re-exports of Sugar into and from certain of the Australian Colonies in each of the Years from 1872 to 1887.
- XIII.—Statement of the Exports of Raw Sugar (Domestic Produce) to various Countries from the Mauritius in each Year from 1872 to 1887.
- XIV.—Statement showing the Quantities of Raw Sugar Retained for Home consumption in the United Kingdom, and Average Price in Bond and inclusive of Duty, in each Year from 1872 to 1888.
- XV.—Estimate of the Net Quantity of Raw Sugar used for Refining in the United Kingdom, deducting from the Total Retained for Home Consumption the Imports for Demerara, and Sugar used in Brewing and Distilling.
- XVI.—Statement showing the Quantities of Refined Sugar Imported and Retained for Home Consumption in the United Kingdom, and Average Price in Bond and inclusive of Duty, in each Year from 1872 to 1888.
- XVII.—Statement showing the Consumption of Sugar in the United Kingdom since 1871.
- XVIII.—Statement showing the Average Quantities of Raw and Refined Sugar Retained Annually for Home Consumption in the United Kingdom, and Average Price (in Bond and inclusive of Duty when Duties levied) in each Quinquennial Period from 1855 to 1884, and in the Four Years 1885-88.
- XIX.—Statement showing the Percentage Increase or Decrease of the Prices of certain Articles Imported into the United Kingdom in the Years 1865, 1868, 1873, and 1875 to 1887, compared with the Price in the Year 1861.
- XX.—Statement showing the Quantity of Raw Sugar of Domestic Produce Exported from Principal British Possessions in each Year from 1872 to 1887.
- XXI.—Supplementary Statement showing the Exports of Raw Sugar from the British West Indies in each of the Years from 1872 to 1887, inclusive.
- XXII.—Statement of the Output of Sugar Refineries at Greenock in 1888, with Estimate of Fixed and Floating Capital engaged, compared with 1879 and 1884.
- XXIII.—Statement showing the Number of Refineries and Output of Sugar on the Clyde in each Year from 1869 to 1888.
- XXIV.—Detailed Information concerning the Sugar Refining Industry in 1888.
- XXV.—Statements respecting Consumption of Refined Sugar and Employment of Labour in the Jam and Confectionery Manufacture.
- XXVI.—Memoranda respecting Bounties in Austria-Hungary, Belgium, France, Germany, the Netherlands, and Russia (including Poland).
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EUROPEAN SUGAR BOUNTIES AS AT PRESENT EXISTING.

The following Memoranda respecting bounties in Austria-Hungary, Belgium, France, Germany, the Netherlands, and Russia (including Poland) are taken from the Parliamentary Report, No. 172, Session 1889, just issued:—

AUSTRIA-HUNGARY.

By the Austro-Hungarian law of 1888 a direct bounty on exportation is now granted from 1st August, 1888, instead of the drawback allowances under the former law. The rates of bounty are as follows:—

		<i>Per Met. Ctnr.</i>	<i>Per Cwt.</i>
		<i>Fl. kr.</i>	<i>s. d.</i>
(a)	Sugar-polarising, 99·5 and above.....	2 30	.. 2 4
(b)	Ditto 93 to 99	1 60	.. 1 7½
(c)	Ditto 88 to 93	1 50	. 1 6½

The amount of bounty payable in one year is, however, limited to 5,000,000 florins, and all manufacturers producing sugar are liable for the repayment of the excess. The exports for the three years 1885, 1886, and 1887 were respectively 2,413,179 centners, 2,417,310 centners, and 2,228,361 centners; so that only a small increase from this average would take up the whole allotted bounty. The figures for 1888 are not yet available, but will, it is presumed, be before the Special Commission. No disguised bounty is supposed to arise under the present law, as all manufacturing and refining is in bond, and the duty (11fl. per met. centner) levied on going into consumption. (See page 240 *et seq.* of c. 5577, 1888.)

BELGIUM.

The excise on beet sugar is levied according to the volume and density of the juice; the *prise en charge*, or legal yield, having hitherto been 1,500 grammes per hectolitre of juice per degree of density, and the bounty arises from this taxed yield being 300 grammes less than the real yield of 1,800 grammes, which is the figure estimated by the official authorities. The excise is 45 francs per 100 kilos. of second-class sugar (Nos. 10 to 15), and so on in proportion, and this excise can be cleared by exporting sugar. A new law, of the 2nd April, 1889, increases the *prise en charge* to 1,650 grammes per hectolitre of juice per degree, so that the amount of sugar escaping duty would be reduced from 300 grammes to 150 grammes. On the other hand, the rates of drawback are increased

for raw sugar over No. 14 (Dutch Standard), to 46fr. 52c. per 100 kilos. on Nos. 14-16, and 48 fr. 07 c. per 100 kilos. on Nos. 17 and above, having previously been 45 francs. The produce of the excise and import duty on sugar is fixed at a minimum of 1,500,000 francs per quarter, *i.e.*, 6,000,000 francs per annum, any deficit being charged to the refiners and manufacturers. (*See* pp. 72 *et seq.* of c. 5260, 1888.)

FRANCE.

The New French Sugar Law of 1888 is explained, and a comparison of it made with the previous law of 1884, in a memorandum sent by the Board of Trade to the Foreign Office on 1st August, 1888 (*see* c. 5604, pp. 185, 186), from which the following extract is made:—

“*The French Sugar Bounties.*—The French law of 1884 was passed with a view to increase the bounties on sugar, so that both manufacturers and refiners might compete with Germany and other bounty-giving countries. This law provided for levying the excise on the presumed yield of sugar instead of on the sugar itself; and after it had been in operation for two years its effect was thus stated by M. Wilson, the Chairman of the Budget Commission, in November, 1886:—He said that for the past year about 72,000,000 fr. had been lost to the Exchequer by means of the bounties. The duty being 50 fr. per sack of 100 kilog., while only two sacks was the legal or presumed yield of a certain quantity of beet, in reality three sacks were produced, and the third sack thus paid no duty at all. If this third sack was exported the duty of 50fr., which it ought to have paid, but had not, was returned as drawback, and thus on the three sacks there was a bounty of 50fr., or 16·65fr. on each sack of 100 kilog. (about 6s. 6d. per cwt.).

“In 1887 a further Law was passed to reduce this large bounty in two ways: (1) by increasing the presumed, *i.e.*, the tax yield; and (2) by levying a surcharge of 10fr. on all sugar produced, including the presumed yield. By the first change the presumed yield, which had been 6·25 per cent. of roots according to the previous law, was at once raised to 7 per cent., with an increase of 0·25 per cent. in each year up to 1890-91, when it would become 7·75 per cent. By the second change a certain portion of the duty was levied on the final production, and the drawback, as far as that portion of the duty was concerned, became equal to the duty. The whole duty now became 60fr. instead of 50fr., which it had been previously, and this became also the drawback. The whole effect was that, supposing 1,000 kilog. of beet were estimated to produce 70 kilog. of sugar, this would now pay $70 \times \frac{60}{100} = 35$ fr. on the assumed yield, and would also pay at the rate of 10fr. per 100 kilog. on the real yield, which was about 100 kilog. This 10fr. added to the 35fr., would make 45fr.;

but there would still be a bounty, namely, 15fr. on export, since 60fr. would be returned on the export of these 100 kilog. of sugar, made from the 1,000 kilog. of beet.

"The present law extends these principles by making 40fr. only payable on the assumed yield, and 20fr. on the real yield. Thus, from 1,000 kilog. of beet, the assumed yield of 70 kilog. of sugar would be taxed at 40fr., $70 \times \frac{40}{100} = 28$ fr., and the actual yield of 100 kilog. at 20fr. would be $100 \times \frac{20}{100} = 20$ fr., making the total tax 48fr. instead of 45fr. under the 1887 law, and leaving the bounty 12fr. per 100 kilog. instead of 15fr., i.e., about 4s. 10d. per cwt. instead of 6s. These figures can only be taken as approximate, since they depend on the future actual yield, while by the 1887 law itself as has been seen, the presumed yield was to be gradually raised down to 1890-91, making a further slight reduction in the bounty each year. Moreover, these figures only apply to raw sugar. The molasses regulations, the allowance of $1\frac{1}{2}$ per cent. for waste in refining, the drawback granted to French colonial sugar, amounting to 36.44 per cent. for the year, so as to put them on a par with the French beet-sugar growers, and the allowances for ash and glucose, &c., are all disturbing factors in stating accurately the rate of bounty. The "Produce Markets Review" inserts an estimate made by sugar refiners here, which appears to have attempted to make allowances for all these points, and fixes the 1887 bounty at 6s. 7d. and the new bounty at 5s. 9d. per cwt. But all such estimates are open to question, though there is no doubt about the fact of a substantial bounty, and of a reduction something like what has been stated by the recent law.

"The important fact about the laws of 1887 and 1888 is the division of the tax into a root tax, and a tax on the finished article, the latter being now one-third of the whole tax, and the drawback being, *pro tanto*, equal to the tax. Although the system of arriving at the exact quantity of sugar produced is still imperfect, the law altogether is a step in the right direction."

GERMANY.

The Law of 9th July, 1887, which came into force 1st August, 1888, divides the excise which previously had been wholly in the roots into (1) Root Tax (80 pf. per 100 kil.), and (2) Consumption Tax on the finished sugar (12 marks per 100 kilos.). The drawbacks given on export in respect of the root tax are estimated to give a bounty of about 1s. per cwt., if the yield is one kilog. of sugar from eight kilos. of roots. The surplus sugar is estimated to amount to about 25 per cent., and as the duty on the roots is equal to about 4s. 3d. per cwt. of sugar, this sum when given as drawback on the surplus sugar is equal to about 1s. per cwt. on the total sugar produced.

The drawbacks range from 8m. 50p. on raw sugar, and on refined sugar, of from 90 to 98 per cent., to 10m. 65p. per 100 kilos. of white sugar of 99½ per cent. (See pp. 70 and 71 of c. 5260, 1888.)

RUSSIA.

The present system of levying the sugar duties in Russia, in force since 1886, is stated to give no bounty, except on the Asiatic frontier, where there is a direct bounty on export of 80 copecks per pound (4s. 2d. per cwt.), which will expire in 1891. The amount exported over this frontier was 392,656 pounds in the last half of 1886. The bounty would not at this rate much exceed £70,000 per annum. The sugar is said to compete with the Austrian sugars in the Persian markets. A former law gave loan bounties amounting to from 80 cop. to 1 rouble per pound (4s. 2d. to 5s. 4d. per cwt.), but this law was only temporarily in operation in 1885-86, when there was a large export of sugar from Russia.

Previous to 1881 the system of levying the duties gave a disguised bounty of from 50 to 55 copecks per pound (2s. 8d. to 2s. 11d. per cwt.) (See page 283 *et seq.* of c. 5,577, 1888.)

NETHERLANDS.

The bounty in the Netherlands arises, in the case of raw sugar, from the system of taxing the juice, as in Belgium. The *prise en charge*, or legal yield, is 1·45 kilos up to 1st January, and 1·40 kilos after 1st January, per hectol. of juice per degree of density. Supposing that 1·80 kilos of sugar is the real yield (which has been stated by the official authorities in Belgium to be the real yield in that country), about 20 per cent. of the total produce escapes taxation. The excise being 27 florins over 100 kilos, 5½ florins per 100 kilos, or about 4s. 6d. per cwt., would be the loss to the State on the total production, as compared with what the revenue would have been if no surplus had escaped duty or received an export drawback. The official production is stated at 30,000 tons for 1887-88, which, plus the untaxed yield of 20 per cent. as calculated on this official yield (16 per cent. on the real yield), would be 36,000 tons, or 720,000 cwt., making a loss to the State of £162,000; in addition to the allowances for waste in refining, which are estimated to be in excess of the real waste. The exports from the Netherlands being far larger in amount than this surplus sugar, the whole of this £162,000 may be considered to be an export bounty, and it is equal to nearly £2 per ton on the whole sugar exported. (See as to duties page 91 *et seq.* of c. 5266, of 1888.)

COST OF THE DIFFUSION PROCESS IN LOUISIANA.

BY J. B. WILKINSON, JR.

WITH A LETTER FROM W. J. THOMPSON, OF CALUMET PLANTATION, ON
MACERATION *versus* DIFFUSION. .

The following extract is taken from a pamphlet entitled "The Diffusion Process in Louisiana and Texas":—

ADVANTAGES OF THE PROCESS.

Between the circular and the double-line batteries, I much prefer the double-line. The first is more costly on account of the curves in the pipes, and it has no advantage over the last named, except possibly in the matter of filling the cells. I think its superiority in this respect is doubtful, however, while it is at a decided disadvantage in disposing of the chips. Prof. M. Swenson and some others prefer a single-line battery, because a car or drag for removing the chips could then run directly under the line. I think this argument in favour of the single line worthy of serious consideration.

The number of cells that should form a battery is still a mooted point. Colonel Cunningham is disposed to think that ten or twelve cells are sufficient; some prefer fourteen and others sixteen. I should prefer sixteen, as insuring a better extraction. Working a certain number of tons per hour, the more the cells the longer time chips have in diffusion. The difference between .3 and .6 of 1 per cent. of sugar left in the chips looks small, but it means five pounds of sugar per ton of cane, containing 12 per cent. sucrose. I do not intend to assert that a difference in the number of cells will make that variation, but it would be likely to.

The cost of a diffusion apparatus of the double-line type, with a capacity of 300 tons would be about as follows:—

One ensilage cutter.....	\$800
Comminutor, 3 feet long, 1 foot diameter, of best gun metal, with 36 feet of knives, duplicate knives, dead knives, pulleys, bed plate and machine complete	800
Fans	100
Drags, gearing, &c.....	1,500
One engine, 60 horse power	800
Air compressor and receiver.....	500
Water pumps	400
Pipes	100
Battery of 16 cells	21,000
	<hr/>
	\$26,000

Nearly 40 per cent. more evaporating capacity per ton of cane is required by the diffusion than by the mill process. Diffusion obtains 17 per cent. more juice from the cane than the best mill does, and it is fair to estimate a dilution of 20 per cent. In increasing the evaporating capacity it may be necessary to make additions to the boilers. Good boilers are important in any process, but specially so in diffusion. I think that cylinder boilers should be put out of the sugarhouse and the best modern type of boilers used. All changes made in the construction or equipment of a sugarhouse must, of course, be added to the cost of the diffusion apparatus.

I obtained from a foundryman the following copy of an estimate he furnished a planter for a full sugarhouse outfit, including a diffusion apparatus, of a capacity of 150 tons in 22 hours:—

Battery, 14 cells	\$10,000
Cutters, elevators, fans and drags, complete.....	2,000
Two measuring tanks.....	90
Two engines, each 30 horse power	1,000
Four clarifiers	1,200
Two juice receivers.....	80
Double effect and vacuum pumps.....	6,000
Two water pumps	800
Low-pressure vacuum pan and pump.....	4,500
Mixer and 3 centrifugals	2,700
Engine for centrifugals	400
Four pumps—juice, syrup, &c.....	600
Tanks	990
Fifty sugar wagons	850
Winch, ropes, hooks, &c.	45
Hot-room outfit	395
Four boilers, 200 horse power, complete.....	2,500
	<hr/>
	\$34,150

The diffusion apparatus in the above outfit comes to less than \$15,000.

The tendency should be towards central factories and not to 150-ton outfits, but if a planter intends to keep on in a small way a diffusion battery is more important, proportionately, to him than it is to a large planter. A large planter can have a mill that will give him within thirty pounds of sugar per ton of cane of what diffusion will. It is impossible to get the weight of metal in a small mill to give any such

extraction. The small planter cannot get within seventy-five pounds of what his cane would yield by diffusion. Let us see the gain by diffusion in a small way:—A sugarhouse of a daily capacity of 150 tons would work in sixty days 9,000 tons of cane. A gain of seventy-five pounds of sugar to the ton would be 675,000 pounds of sugar. This at five cents a pound would amount to \$32,750. The increase in one season would pay for the diffusion apparatus twice over! The money is now going out into the bagasse pile, or up in the smoke of the bagasse burner—a burner made not to utilize the bagasse, but to get rid of it. I refer to burners without any boilers attached, so common on small plantations.

The principal advantage of diffusion is the extraction of practically all the sugar in the cane; but there is another worthy of mention. The process is the result of a simple physiological law, and the apparatus is not liable to the costly and vexatious breakdowns so common in the mill process; breakdowns that threaten the planter with ruin and make the days and nights of grinding season hours of anxiety and dread.

The advantages of diffusion are beginning to be appreciated. The success of the process is assured. I believe that within the next two years there will be a rapid change in the sugar industry of Louisiana from the old method to the new, and that with this change will come an era of development and prosperity.

The change has begun already. Captain J. N. Pharr made a contract with the Whitney Iron Works two weeks ago for a 300-ton diffusion battery to be erected on his Glenwild plantation next September. I have heard of other contracts closed, but am not yet at liberty to give the names.

MACERATION COMPARED WITH DIFFUSION.

The average of the crop on Mr. Dan Thompson's Calumet plantation for the last season will amount to 200 pounds to the ton, although the exact figures cannot yet be given, as the wagon sugars are not all dried out. (N.B.—This is the first case of 200 lbs. ever reached, as the average of an entire campaign, in Louisiana.) Learning that this phenomenal yield was in a measure owing to the maceration of the bagasse, I wrote to Mr. Wilbray J. Thompson, to whose excellent management of the sugarhouse the result was due, asking for information on the subject, and requesting him to make a comparison

between the maceration and the diffusion process. His kind response is the following able paper on the subject:—

Calumet Plantation, Bayou Teche, La.,

January 31, 1889.

Mr. J. B. Wilkinson, Junr.

Dear Sir,—Your request of the 29th inst. for data covering recent Calumet experiments in the maceration of bagasse between mills is cheerfully acceded to.

The mills with which these were performed are actuated by a single engine, cylinder 24 inches diameter by 48 inches stroke, provided with Corliss valves and the Joy adjustable expansion gear. The cut-off being ordinarily accomplished only at 42 inches, the engine is practically controlled by the wire-drawing of its governor—a custom rendered permissible by the use of its exhaust, under about 4 pounds average pressure, in juice concentration. An average of 43 revolutions of the engine is maintained under 95 pounds initial steam pressure. For every 100 revolutions of this the first or three-roller mill accomplishes 5.142, and the second or two-roller mill 4.210 revolutions. The principal dimensions of the two mills are given below:—

	Length of rolls between collars. inches.	Diameter of rolls, inches.	Diameter of Driving shaft, inches.	Length of Journals, inches.	Diameter of Journals, inches.
Three-roll mill..	59.50	29.50	12	12	11
Two-roll mill ..	66	40	18	20	16.50

Both mills are heavily double-gearred, with steel pinions and crown-wheels throughout, neither, however, being provided with hydraulic or other safety or pressure regulating attachments. The two-roller mill is driven by its lower roll-shaft, and is provided with a roughening device, believed to possess much merit. The mills are fifteen feet between centres, and are connected by a horizontal rubber carrier.

The apparatus is operated upon a plan unlike that customary in the local milling of cane, in that the feed upon the carriers is maintained as uniform at all times as possible, variations in the amount of cane consumed being regulated to that received from the fields, as nearly as practicable, by altering the speed of the engine, the governor to which is provided with a speeding device. The otherwise constant necessity for change in the mill's set is thus obviated, insuring a uniformity of expression and a reduction of time lost, to

be better secured only, as is believed, by the hydraulic pressure-regulator. The average juice extraction of this mill for a series of years, without maceration and without allowances for trash, expressed in per cents. of the canes' weight, has been:—

	1885-86.	1886-87.	1887-88.	1888-89.
Extraction 5-roll mill juice in per cents. of cane.....	76.30	.. 73.09	.. 74.60	.. 72.45

That of the three-roll mill, prior to the erection of the supplementary rolls, the same engineer remaining in charge throughout:—

	1881-82.	1882-83.	1883-84.	1884-85.
Extraction, 3-roll mill—juice in per cent. of cane	64.70	Inundated, no campaign.	69.84	.. 65.03

This indicates an average advantage, by campaigns, of 7.58 per cent. juice on the canes' weight to the credit of the supplemental mill, in which no account is taken of variations in the character of the canes or the quantities of these treated per hour, both remaining in Louisiana far more constant than on more tropical estates.

The experiment in maceration covered 3,993.26 short tons of cane crushed without, and 3,388.31 tons treated with water. The water employed was cold, no sufficiently adequate reason, so far as known to us, ever having being assigned for the use of hot, especially where precaution against inversion in an immediately subsequent sulphurous acid process seemed advisable. No such inversion worthy of consideration was indicated by the glucose ratios at any time during the experiment.

The water was evenly distributed by a single, finely-perforated pipe, placed parallel to and of equal length with the rolls, under sufficient hydrostatic pressure to be delivered directly into the bite of the three-roll mill, in order that a maximum imbibition might take place during that expansion of the bagasse which occurs as this comes from its severe compression on the bagasse roll.

Chemical control of the work was maintained throughout by Mr. Hubert Edson, chemical division, United States department agriculture; Dr. C. A. Crampton, of the same division, and Herr L. von Tresckow, late chemist to the Wanze Central Factory, Belgium, being also present in the establishment during portions of the work.

For convenience of comparison the data of the two runs, which explain themselves, are placed in parallel columns:—

	Without maceration.	With maceration.
Cane ground, tons of 2,000 lbs., no allowance } for trash..... }	3,993·26	3,388·31
Cane ground, lbs.....	7,986,525	6,776,623
Sucrose in cane, 10 per cent. fibre assumed, lbs...	1,016,365·24	843,486·44
Juice obtained, dilute, gals. ....	....	675,243
Juice obtained, normal gals.	650,878	599,213
Juice obtained, dilute, lbs.....	....	5,963,388
Juice obtained, normal, lbs.	5,786,909	5,327,383
Sucrose in juice obtained, lbs., by analysis.....	818,268·93	736,478·41
Sucrose left in bagasse, lbs., by difference	198,096·31	107,008·03
Sucrose left in bagasse, per cent. sucrose in cane..	19·49	12·69
Sucrose obtained in juice, per cent., sucrose in cane	80·51	87·31
Sucrose obtained per 1000 in cane, lbs.	805·10	873·10
Gain sucrose per 1000 by maceration, lbs. ....	....	68·00
Sucrose lost, first period, by not macerating, lbs.	69,112·84	....
Sucrose lost, first period, ditto, per ton cane, lbs..	17·31	....
Sucrose gained, second period, by macerating, lbs.	....	57,357·08
Sucrose gained, second period, per ton cane, lbs..	....	16·93
Average dilution on entire volume of juice, by } volumes .....	....	12·69
Average dilution, ditto, by weights .....	....	11·91
Mill extraction, normal juice per cent. of cane ..	72·45	78·61
Average tons crushed per hour	14·22	14·03

The fact that by this simple expedient the mills' extraction of 100 per cent. sugar would have been increased over 17 pounds per short ton of cane had similar maceration being practised during both periods of the experiment, requires no comment. The gain of normal juice attributable to it is seen to be 6·16 per cent. on the canes' weight, against that of but 7·58 per cent., already stated as due to the erection of the powerful supplemental mill itself.

Notwithstanding these significant figures I cannot recommend an advocacy of its promiscuous adoption. The dilution, estimated daily on the whole volume of juice secured, varied from 9·46 to 15·49 per cent. This last figure approaches that of diffusion, as this season exemplified at Sugar Land and Magnolia. In incompetent or inattentive hands the most unreasonable extremes might be anticipated, with a predominating tendency always towards maxima. Even more than diffusion, if possible, should its practice, therefore, be under unremitting chemical control. Its efficiency must be directly and closely related to the excellence of the bagasse produced by the first mill,

the excellence of the second mill and the distance between these two, which last, in Louisiana, is probably most often inadequate to its best performance.

It demands multiple effect evaporation, as a safeguard against inversion and as an economy of fuel, scarcely in less degree than diffusion itself. It is by no means so efficient as is the last named process, and, if my experience is a guide, reduces notably the steaming quality of the green bagasse. In a well-balanced establishment, already worked to full capacity, it demands an increase, at least, in defecator, filterpress, and evaporative power, all but equal to the requirements of diffusion. It is a makeshift only, and as such, excellent as it is, should, in my opinion, not be permitted to delay for an hour the introduction of the better process.

Whereas, yet superior work to that here reported is now confidently expected of it during the next campaign of this factory. I must unequivocally dissent from the recently expressed opinion of Mr. Alexander, of Demerara, which holds it possible for maceration to attain economic results equal to those of the diffusion process. (See *Sugar Cane*, Volume XX., No. 233, page 633; and *Louisiana Planter and Sugar Manufacturer*, Volume I., No. 26, page 303.) In Louisiana at least, quite aside from the abundance of good water and the relative cheapness of fuel, it can do nothing of the sort. I trust you will pardon digression from the line of your enquiries, but this matter seems too vital to the best interests of our cherished industry to be passed lightly over at this crisis.

It has now come to be known that a mill establishment has attained average crop results in commercial sugar considerably exceeding those of all three houses possessing diffusion apparatus. The moral effect of this, it is said, must operate in the direction of further delay to that rehabilitation and reorganization of the industry upon a basis of diffusion in central factories which appear to us so essential and seemed so near at hand. Against any such effect I desire here to enter my most earnest protest, trusting that it may be permitted me to speak the more authoritatively, and, it is to be hoped, the more convincingly, that the mill establishment which has accomplished this result has done it under my direction.

In the case of each, among these three batteries, extraction has been carried to a point quite beyond the utmost dream of mill enthusiasts. In the case of each, all the difficulties incident to a first campaign with

new installations had to be met, yet these in no instance attaching to the batteries themselves after the first few days of operation. Two of them handled canes greatly inferior to those of this section. Of these, one started fires too soon; the other is even yet unfinished. One of them, during a run on superior cane, secured over 12½ per cent. of merchantable sugar—*over 250 pounds per ton of cane!* As to the third, that most likely of selection for disparaging comparison, the discouragements of its campaign, none of them after the first in the remotest degree traceable to diffusion, are altogether beyond the belief of any but those who, like myself, witnessed them in part. Magnolia's experience in 1888 has, in many ways, been parallel with that of Belle Alliance in 1874. Forbid it that any such after parallel exist in the misinterpretation of her results! No such victory for crushing will ever again be won. Indeed, had it not been for recourse to milling during a repair of leaking heaters, Magnolia would, beyond all preadventure, to-day hold the record despite her every other misfortune. Ever so presumptuous as it may be thought, I do not hesitate to tell you as my most deliberate conviction, that, had her diffusion juice entered the defecators of this house the average register of commercial sugar would not have fallen under 245 pounds per ton of cane. It might well have proved more.

Happily, for the partial substantiation of these views, means are at hand for the immediate and withal satisfactory institution of an interesting and valuable comparison between the effectiveness of diffusion and maceration, both as applied to the cane so lately treated here by the latter method.

During a two-day visit at Sugar Land the exhausted chips were reported to me by its chemist, Mr. Hart, as assaying 0.4 per cent. sucrose, with an average dilution of 18 per cent. At Magnolia I found the chips carrying off at the time, by Mr. Spencer's analysis, only 0.3 of a per cent., with about the same juice dilution. Both batteries were in regular industrial practice. I conclude, therefore, that 0.4 per cent. loss of sucrose in the bagasse, and 20 per cent. dilution, are reasonable figures to assume as industrial averages under a faithful control of this process with 14 to 16 cells. At both factories it had been ascertained that the weight of exhausted chips corresponded almost exactly with that of the fresh.

In our Calumet experiments, with a complete model apparatus, it had been demonstrated to our own satisfaction at least, as explained

to you under date of January 13th (see *Daily City Item*, Monday, January 21st, 1889), that in point of purity and crystalizing power, the advantage resided always with diffusion, as compared with strictly corresponding mill juices. I therefore conclude, in like manner that the yield of commercial sugar would bear essentially the same ratio to pure sucrose present in the juice, extracted by diffusion, as it would to that secured by maceration.

Lastly, whereas we are yet engaged in drying the final products from it, it is now none the less evident that the return per ton of cane for our maceration run will not greatly vary from 215 pounds commercial sugar. These accepted as premises, the following direct comparison becomes one which further experience may be expected to justify:—

	Maceration (as before.)	Diffusion.
Cane treated, tons, no allowance for trash	3,388.31	
Cane treated, lbs.....	6,776,623	
Sucrose in cane treated, lbs.	843,486.44	
Extraction of sucrose, per cent. of cane's content	87.31	96.68
Sucrose in juice extracted, lbs.	736,478.41	816,379.95
Sucrose lost in bagasse, etc., lbs.	107,008.03	27,106.49
Sucrose lost in bagasse per ton cane, lbs.	31.58	8.00
Gain, sucrose in juice by diffusion, per ton cane, lbs. ....	..	23.58
Commercial sugar obtained per ton cane, lbs.	215.00	238.31
Gain commercial sugar by diffusion, per ton cane, lbs. ....	..	23.31
Dilution by weight, per cent.....	11.94	20.00
Excess of dilution chargeable to diffusion .....	..	8.06

From this comparison it is evident that maceration emerges with less than half a victory. After making a neat gain of 17 pounds per ton of cane over mere double crushing, it yields in turn by some 23 pounds to its more potent rival.

Were this diffusion's sole claim on our most favourable consideration it would yet appear sufficient. But when it adds thereto inimitable simplicity and durability, and a reliability which is un-

questioned—a freedom from breakdown and consequent ruinous delay, such as is all but absolute; when it promises simplified and perfected depuration, and along with this a rational mechanical filtration; when it assures riddance to scum-tank and filterpress nuisances; and when, most certain and most important of all, it opens an easy avenue to the realization of the central factory—surely it has the inalienable right to expect of our proverbial 'ingenuity a speedy and satisfactory solution of its only serious remaining problem—the rational disposition of its exhausted chips. If it required a generation and more to solve this same for our mill bagasse, we need feel no discouragement because for diffusion this has remained a stumbling-block through a single year.

It needs scarcely be added after this that, should its present far-seeing and indefatigable proprietor live otherwise to prepare the factory for the reception of such, and inimical national legislation opposes in the interim no undue obstacle, Calumet will not, by any means, be the last equipped with diffusion plant, however that for the fourth time it has now broken all existing records with its mill.

I believe you will quite agree with me that any discussion in this place of the fuel problem, which so intimately connects itself with the foregoing, would be adventitious. While, at best, juice is concentrated to syrup only in double-effect, and sugar continues in our most advanced practice to be irrationally boiled in single; while at Wono-pringo and elsewhere abroad diffusion chips continue to be burned with marked economic success; and, finally, while sugar here remains at five cents a pound and coal at five dollars a ton upon the grates, it would appear in poor taste and worse judgment to lay that disingenuous stress upon this, which attaches always, as a last resort, to the last forlorn hope of every factious opposition.

Yours very truly,

WIBRAY J. THOMPSON.

The Directors of the Colonial Bank have resolved to recommend at the Half-yearly General Meeting of the Proprietors, on the 4th inst., a dividend of five per cent. for the half-year ending December 31st, 1888, being at the rate of ten per cent. per annum.

NOTES ON BOOKS.

“THE WEST INDIES.” By C. Washington EVES, F.R.G.S. Published under the auspices of the Royal Colonial Institute. London: Sampson Low & Co. Crown 8vo., cloth. 1889. 7/6.

This volume will repay a perusal. The author can speak with some authority upon the subject he treats, having an intimate acquaintance with the West Indies, and particularly of Jamaica, our largest possession in these Islands, and was one of the gentlemen connected with the Crown Colonies, nominated to represent Jamaica at the Colonial Conference (1887).

There is not a passage in the book which can offend the political or religious opinions of any; no tirades against this Government or that; nor are there any contemptuous remarks, *a la* Carlyle, about the coloured race, which in Jamaica are, as compared with the white population, about 40 to 1. Mr. Washington Eves prefaces his account of the different islands with a short sketch of their history from their discovery by Columbus; his description of the scenery and flora of some of them is equal to any to be found in Mr. Froude's “English in the West Indies”; what he tells us of the climate and their general healthiness will take some by surprise, who, having lost friends or relatives by fever, have formed a different, and no doubt an erroneous, conclusion from these isolated cases. We have a letter before us from a gentleman residing in Jamaica, whose daughter was down with the fever at the time he wrote, longing to get away from the island, which he spoke of as a fever hole. No doubt that where he lived is one of the few districts which Mr. Eves, in his book, takes exception to.

The statistics given are sufficient, without running the risk of being tedious even to those who have no taste for them; they are significant as showing the very great change which has taken place of recent years in the direction of the trade of the West Indies. The exports to this country have largely diminished, and the exports to the United States have greatly increased; and where the exports go to, thence in time must the imports largely come from.

Where so much is good, it is not easy to make selections; we, however, give a few extracts, which will give some idea of the book, which we can strongly advise all who have any interest in our possessions in the West Indies to buy and read.

The account opens with Barbados, which is probably the most healthy, and certainly the most populous per square mile of any of the

islands, and has, perhaps, passed through the sugar crisis of the past four years with less injury than any of them. Mr. Eves strongly urges the adoption of the Central Factory system, as shown by the following:—

Instead of 30,000, 40,000, or 50,000 tons (which latter used to be considered a very good crop), that of 1888 will reach to upwards of 70,000 tons. If the system of central factories, by which is meant a factory with the latest improvements and very best machinery, to work up the canes from a number of contiguous estates, could be established, the quantity of sugar would be still more largely increased, the quality improved, and the cost of manufacture reduced. This is the system which has been carried out with great success in the French colonies, and has also been fairly started in St. Lucia. Two or three sites in Barbados are particularly adopted for central factories. It is obvious that a single estate—and in this island the estates do not as a rule run to a very large extent—could not afford costly buildings and plant all to itself. Such a system could only be a success when carried out upon a large scale, with a constant and full supply of canes to keep the factories going. In some such scheme as this, indeed, lies the future prosperity of the sugar islands. Experts say that Barbados ought to turn out good sugar at a cost of £8 to £10 per ton, which, at a moderate price (and prices will rarely be very high again), ought to leave margin for sufficient profit. The value of exports from Barbados in 1887 was £1,063,397, and the imports £983,187, making a total trade of £2,046,584.—(Page 26.)

Mr. Eves gives a long chapter to Jamaica, and commences by reproducing the following story of the rough and ready description of it by Columbus:—

The story of Columbus crumpling up a piece of paper in his hand, and then showing it to Queen Isabella as a description of Jamaica, is so good and apposite that it deserves to be historically true if it be not so. It is, indeed, a "crumpled" country, of the most diversified beauty—hill and valley, mountain ridge and sheer precipice, rough fissure and romantic glen, the whole enlivened and animated with cascades, streams, and rivers of all sizes and forms.—(Page 47.)

This is what the author says of the climate of Jamaica:—

The climate of Jamaica promotes longevity. During day the refreshing sea breeze makes existence not only tolerable but exquisitely enjoyable. A moderate wind from the mountains keeps the nights deliciously cool. At a height of 225 feet above Kingston the mean yearly temperature is 78°, and it naturally falls according to the rise of ground. Dr. Phillippo, in his well-known book on the climate of Jamaica, says that even delicate invalids can live virtually in the open air, carefully avoiding, of course, chills and

draughts. The few insalubrious spots in the island, or an occasional outbreak of fever in Kingston, do not detract from the remarkable general healthiness. Once on the upper ground all fear of miasma is at an end. Nothing can exceed the bright life-giving influences of the air, to breathe which is an exhilaration. Nor is this account of the climate a theoretical exaggeration. The practical testimony of many who have derived real benefit from it could be brought forward. Those who would die if they remained in the fogs of London, or the snows and frosts of New York, obtain a fresh lease of life by spending the winter in Jamaica. For weak chests, unsound lungs, and bronchial disorders, the climate is peculiarly suited. The testimony of many medical men might also reassure the patient. The late Dr. Bowerbank, the principal physician for many years in the island said :— "There can be no doubt that where a predisposition to tubercular and scrofulous diseases exist, a residence in Jamaica will completely check its further development, and even during the earlier stages of tubercular consumption, if its progress be not arrested, life is prolonged, and the disease divested of much of its suffering."—(Page 50.)

And of Mandeville (in the parish of Manchester, and the county of Middlesex) :—

The life and bustle of this town of Mandeville, with its many prosperous inhabitants engaged in fruit and corn growing and other pursuits, make it a pleasant epitome of Jamaica, while a month in its clear and healthy atmosphere is worth six months in any European resort, where the vital forces are wasted and burnt up over the excitement of gambling tables. Besides the articles already mentioned in connection with other parishes, ginger is produced in Manchester.—(Page 54.)

The following eloquent description of the five miles from Spanish Town to Bogwalk, Mr. Eves quotes from Lady Brassey's "The Trades, the Tropics, and the Roaring Forties," (8vo edition, page 251) :—

"Imagine everything that makes scenery lovely : wood, rock, water, and the wildest luxuriance of tropical foliage, mingled and arranged by the artistic hands of nature in one of her happiest moods, and then picture all this surrounded by lofty and abrupt precipices, with a back ground of the most brilliant blue, illuminated by the brightest of suns (the heat of which on the present occasion was tempered by a gentle breeze which rippled the surface of the river). The Bog Walk is a gorge through which the Rio Cobre flows towards the sea. As we passed out, the sides of the ravines became less precipitous, and were clothed with all kinds of tropical trees, such as the sloth, bread fruit, and bamboos, besides vast quantities of flowering orchids."—(Page 68.)

From the effects of the law of 1846, equalising the duties upon free

grown and slave grown sugars, Jamaica, as a sugar-producing country, has never recovered :—

Railway schemes were projected, and to some extent carried out. But the home legislation of 1846, involving the equalisation of the duties on free-grown and slave-grown sugar, practically put the colonial productions at a great disadvantage in European markets. The sugar production fell to a point, from which it has never recovered. Estates worth their thousands a year became valueless. Estates that had to go into Chancery because the proprietors were unable to manage them, through incompetence of mind, dwindled away from their thousands of annual income, to a position in which they could not pay a small merchant's commission. Many profitable properties were thrown up, and large districts of the colony returned into bush.— (Page 83.)

And yet Jamaica has a great future before her :—

Jamaica has a great future, but in order to secure it, people in England must wake up to the fact of the value of the great possession, and people must send their sons, invest their money, exercise their influence, and enlarge their sympathy, so that the prosperity of the country may be assured, that it may contribute its proper proportion to the wealth of the world, and that the old bad days of struggle, selfishness, disaster, and cruelty may be forgotten in the dawn of a day the light of which shall shine upon a happy and contented people, living under fairer auspices and juster conditions than were ever known or enjoyed before.—(Page 92.)

Nowhere in the West Indies has there been displayed so much energy, or anything like the same amount of capital invested in the sugar trade of late years as in British Guiana. Of its climate the author thus speaks :—

The climate has been subject to much animadversion, especially by people who know nothing about it. It is hot, but certainly not unhealthy, a fact proved by the vigorous health enjoyed by many English planters who have spent a great portion of their lives in the colony. Men advanced in years have been known to retain all the physical and mental energy, together with all their capacity for work of all kinds, up to the very last. There may be an occasional epidemic of yellow fever, as there are analogous periods of fever, smallpox, and cholera in England. But this application of the law of diseases, from which no country in the world is free, does not militate against the general excellence of a particular climate. The bland, warm, and moist atmosphere is particularly adopted to cases of threatened or incipient phthisis (consumption) ; and even in a more advanced form of the disease, life would be prolonged in British Guiana.—(Page 113.)

He supplements his own opinion by that of Sir R. Schomburgk's :—

Sir R. Schomburgk, whose knowledge of the climate is beyond dispute, affirms that "the salubrity of the interior is proverbial, and there are many instances of longevity among the settlers on the banks of the rivers Demerara, Berbice, and Essequibo. The natural drainage is here so perfect, that all impurities are swept off by the torrents of rain, and the purity of the air is so great that the planets Venus and Jupiter may be seen in the daytime. While descending the Upper Essequibo, in December, 1838, we saw, one afternoon at three o'clock, the sun, the moon, and the planet Venus."—(Page 114.)

A great contributor to the great strides made in British Guiana, in the production of sugar, is Coolie labour; and what Mr. Eves says of this race, so far as British Guiana is concerned, is very pleasant reading:—

There are at the present moment more than 100,000 Coolies in the colony who have been introduced from the East Indies, or who are the children of those who have been so introduced. Upon the steady labour afforded by these people the colony has thriven. Without Coolie emigration the present cultivated portion would have been a land of swamps and ruined embankments, or perhaps washed over by the sea. The system of emigration, established about 1850 and elaborated through successive years to its present efficiency and completeness, has been amply demonstrated as beneficial to all parties. It is a release to the famine-stricken districts of India; it is good for the Coolie, because it makes a man of him by giving him an adequate reward for his industry; it is good for the planter, because he obtains that command of steady labour, upon which all his operations depend; the shopkeepers increase their business by the presence of a new, large wage-earning class; the negro has his share of the advantage, because he has opportunities of well-paid work, which he would not have if the estates had not been continued or fresh ones set going; and the Government and all the institutions of the country are better supported, in consequence of increased revenue, which follow an expansion of production and trade. Upon the whole, therefore, although not an increasing race in British Guiana, those of African descent are prosperous, and not by any means the least intelligent of similar communities of the West Indies.—(Page 124.)

The subject of "diffusion," as applied to the sugar cane, is one which engages a great deal of attention just now. The results of the experiments now being made by Mr. Quintin Hogg in Demerara, we give in another part (see page 353). Favourable as these figures appear, to our minds the success of the system is not as yet a *fait accompli*. The process of diffusion is thus described by Mr. Eves:—

The process of diffusion has recently been attracting much attention,

especially from the success which it has secured in the beet sugar factories of the continent of Europe. It might be thought, at first sight, that to cut a root like a turnip into slices, was an easier thing to do than to cut a fibrous plant like the sugar cane. But this difficulty has been overcome by scientific skill, especially in the construction of the knives to be used. The cane being cut into slices, and soaked into water, the crystallisable sugar in the juice will pass through the cells into the water, while the uncrystallisable part of the juice remains in the cells of the cane. This separation of the contents of the cane is diffusion. When the cane is sliced, it is automatically put into a series of open diffusors, the liquor flowing by simple gravity from one to the other, and connected with each diffuser is a steam chamber, by the effect of which the sugar is separated from the non-crystallisable elements of the juice in the cane. It is, indeed, a principle of purification at each step of the process; and as these steps progress, the identity of the sugar becomes more marked and recognisable, and capable of further process of being transformed into marketable produce. M. Robert's system has been known for many years in connection with the beet, and it is also the subject of experiment in different cane countries —(Page 140.)

In considering the reports of the results of the experiments now being made, it is well to keep before us some of the disadvantages of the system, as pointed out by Mr. Neville Lubbock when speaking upon the subject of diffusion in 1887. The extract we give is from Mr. Eve's book :—

DISADVANTAGES OF THE DIFFUSION PROCESS.

1. Where mills now exist the money spent upon them is lost, and further capital must be sunk in diffusion plant.
2. A largely increased evaporation is required, involving considerable outlay of capital and increased working expenses.
3. The megass now obtained and utilised as fuel is lost.
4. Expense of getting rid of Schnetzel.
5. Expense of water required.—(Page 146.)

Mr. Washington Eves does not at all exaggerate the importance of the question of the abolition of sugar bounties as it respects British Guiana, or, indeed, any of our sugar colonies. If sugar growing should become so unprofitable as to be abandoned, the consequences to Demerara would be most serious :—

There is no new process but what has been tried there. This is the only way in which the beet industry can be kept pace with. Sugar is the staple of Demerara. The cost of producing a ton of sugar has been much reduced of late years, but this limit has now practically been reached. Without the foreign bounties the extra richness of the cane will tell, and the prosperity

of this colony be secured. As has been said above, all classes of the community depend upon sugar, and if this industry were, from any cause, allowed to decline or be destroyed, the consequences must be disastrous to the colony.—(Page 150.)

Trinidad used to be considered unhealthy; but this, Mr. Eves states, is not the case. Its healthiness, he says, is apparent from the men who have lived there; some English families having been on the spot for a long time. Our space forbids our giving what he says on this subject, but we must not omit his description of the Usine St. Madeleine, in this colony, erected by the Colonial Company:—

To see sugar making in connection with the most advanced processes, a visit should be made to the Colonial Company's famous usine of St. Madeleine. The canes are brought by tramways from the contiguous estates; they are crushed in the mill, the boiling and filtration processes of the juice are carried out, until, having passed through turbines, the fine crystals are produced. This usine of St. Madeleine can be easily reached by carriage from San Fernando or by the Cipero tram, which goes up from the coast. It is only about four miles from San Fernando. It is by far the best appointed institution of the kind in the West Indies. The usine is in the centre of some of the Colonial Company's best estates, for a constant supply of canes is necessary to keep the elaborate machinery going. The estates are connected with the usine by a system of railways or tramway. Engines and trucks are always at work upon these lines, carrying canes to be worked up, or sugar to the nearest point of the Cipero tramway, to be transported to the coast of San Fernando. Altogether there are about twenty-five miles of railway serving the purposes of this usine. The shops, too, for repairs, are a sight to see. The great mills, made by Fletcher, of Derby, the megass-burning boilers, the lifting apparatus, the vacuum pans and tripple effect vessels, the electric light, all make up a wonderful picture of the practicalities of sugar making in the present year of grace. All the elements of successful competition with the beet are here, and the work turned out is on the largest scale, the usine being probably one of the largest in the world. Every year sees the cost of production less. The cost has been reduced 50 per cent. during the last fifteen years.—(Page 184.)

Our space forbids us giving further extracts.

The other islands mentioned in the book are—Tobago, Grenada, St. Lucia, St. Vincent, Martinique, Dominica, Guadeloupe, Montserrat, Nevis, St. Kitts and Anquilla, Antigua, The Virgin Islands, Porto Rico, Cuba, The Bahamas, British Honduras, Surinam, Cayenne, and Hayti.

The volume contains numerous plates and maps, but is lacking in an index at the end—so useful for reference.

new installations had to be met, yet these in no instance attaching to the batteries themselves after the first few days of operation. Two of them handled canes greatly inferior to those of this section. Of these, one started fires too soon; the other is even yet unfinished. One of them, during a run on superior cane, secured over $12\frac{1}{2}$ per cent. of merchantable sugar—*over 250 pounds per ton of cane!* As to the third, that most likely of selection for disparaging comparison, the discouragements of its campaign, none of them after the first in the remotest degree traceable to diffusion, are altogether beyond the belief of any but those who, like myself, witnessed them in part. Magnolia's experience in 1888 has, in many ways, been parallel with that of Belle Alliance in 1874. Forbid it that any such after parallel exist in the misinterpretation of her results! No such victory for crushing will ever again be won. Indeed, had it not been for recourse to milling during a repair of leaking heaters, Magnolia would, beyond all preadventure, to-day hold the record despite her every other misfortune. Ever so presumptuous as it may be thought, I do not hesitate to tell you as my most deliberate conviction, that, had her diffusion juice entered the defecators of this house the average register of commercial sugar would not have fallen under 245 pounds per ton of cane. It might well have proved more.

Happily, for the partial substantiation of these views, means are at hand for the immediate and withal satisfactory institution of an interesting and valuable comparison between the effectiveness of diffusion and maceration, both as applied to the cane so lately treated here by the latter method.

During a two-day visit at Sugar Land the exhausted chips were reported to me by its chemist, Mr. Hart, as assaying 0.4 per cent. sucrose, with an average dilution of 18 per cent. At Magnolia I found the chips carrying off at the time, by Mr. Spencer's analysis, only 0.3 of a per cent., with about the same juice dilution. Both batteries were in regular industrial practice. I conclude, therefore, that 0.4 per cent. loss of sucrose in the bagasse, and 20 per cent. dilution, are reasonable figures to assume as industrial averages under a faithful control of this process with 14 to 16 cells. At both factories it had been ascertained that the weight of exhausted chips corresponded almost exactly with that of the fresh.

In our Calumet experiments, with a complete model apparatus, it had been demonstrated to our own satisfaction at least, as explained

to you under date of January 13th (see *Daily City Item*, Monday, January 21st, 1889), that in point of purity and crystalizing power, the advantage resided always with diffusion, as compared with strictly corresponding mill juices. I therefore conclude, in like manner that the yield of commercial sugar would bear essentially the same ratio to pure sucrose present in the juice, extracted by diffusion, as it would to that secured by maceration.

Lastly, whereas we are yet engaged in drying the final products from it, it is now none the less evident that the return per ton of cane for our maceration run will not greatly vary from 215 pounds commercial sugar. These accepted as premises, the following direct comparison becomes one which further experience may be expected to justify:—

	Maceration (as before.)	Diffusion.
Cane treated, tons, no allowance for trash	3,388·31	
Cane treated, lbs.....	6,776,623	
Sucrose in cane treated, lbs.	843,486·44	
Extraction of sucrose, per cent. of cane's content	87·31	96·68
Sucrose in juice extracted, lbs.	736,478·41	816,379·95
Sucrose lost in bagasse, etc., lbs.	107,008·03	27,106·49
Sucrose lost in bagasse per ton cane, lbs.	31·58	8·00
Gain, sucrose in juice by diffusion, per ton cane, lbs. ....	..	23·58
Commercial sugar obtained per ton cane, lbs.	215·00	238·31
Gain commercial sugar by diffusion, per ton cane, lbs. ....	..	23·31
Dilution by weight, per cent.....	11·94	20·00
Excess of dilution chargeable to dif- fusion .....	..	8·06

From this comparison it is evident that maceration emerges with less than half a victory. After making a neat gain of 17 pounds per ton of cane over mere double crushing, it yields in turn by some 23 pounds to its more potent rival.

Were this diffusion's sole claim on our most favourable consideration it would yet appear sufficient. But when it adds thereto inimitable simplicity and durability, and a reliability which is un-

questioned—a freedom from breakdown and consequent ruinous delay, such as is all but absolute; when it promises simplified and perfected depuration, and along with this a rational mechanical filtration; when it assures riddance to scum-tank and filterpress nuisances; and when, most certain and most important of all, it opens an easy avenue to the realization of the central factory—surely it has the inalienable right to expect of our proverbial ingenuity a speedy and satisfactory solution of its only serious remaining problem—the rational disposition of its exhausted chips. If it required a generation and more to solve this same for our mill bagasse, we need feel no discouragement because for diffusion this has remained a stumbling-block through a single year.

It needs scarcely be added after this that, should its present far-seeing and indefatigable proprietor live otherwise to prepare the factory for the reception of such, and inimical national legislation opposes in the interim no undue obstacle, Calumet will not, by any means, be the last equipped with diffusion plant, however that for the fourth time it has now broken all existing records with its mill.

I believe you will quite agree with me that any discussion in this place of the fuel problem, which so intimately connects itself with the foregoing, would be adventitious. While, at best, juice is concentrated to syrup only in double-effect, and sugar continues in our most advanced practice to be irrationally boiled in single; while at Wono-pringo and elsewhere abroad diffusion chips continue to be burned with marked economic success; and, finally, while sugar here remains at five cents a pound and coal at five dollars a ton upon the grates, it would appear in poor taste and worse judgment to lay that disingenuous stress upon this, which attaches always, as a last resort, to the last forlorn hope of every factious opposition.

Yours very truly,

WIBRAY J. THOMPSON.

The Directors of the Colonial Bank have resolved to recommend at the Half-yearly General Meeting of the Proprietors, on the 4th inst., a dividend of five per cent. for the half-year ending December 31st, 1888, being at the rate of ten per cent. per annum.

NOTES ON BOOKS.

“THE WEST INDIES.” By C. Washington EVES, F.R.G.S. Published under the auspices of the Royal Colonial Institute. London : Sampson Low & Co. Crown 8vo., cloth. 1889. 7/6.

This volume will repay a perusal. The author can speak with some authority upon the subject he treats, having an intimate acquaintance with the West Indies, and particularly of Jamaica, our largest possession in these Islands, and was one of the gentlemen connected with the Crown Colonies, nominated to represent Jamaica at the Colonial Conference (1887).

There is not a passage in the book which can offend the political or religious opinions of any ; no tirades against this Government or that ; nor are there any contemptuous remarks, *a la* Carlyle, about the coloured race, which in Jamaica are, as compared with the white population, about 40 to 1. Mr. Washington Eves prefaces his account of the different islands with a short sketch of their history from their discovery by Columbus ; his description of the scenery and flora of some of them is equal to any to be found in Mr. Froude’s “English in the West Indies” ; what he tells us of the climate and their general healthiness will take some by surprise, who, having lost friends or relatives by fever, have formed a different, and no doubt an erroneous, conclusion from these isolated cases. We have a letter before us from a gentleman residing in Jamaica, whose daughter was down with the fever at the time he wrote, longing to get away from the island, which he spoke of as a fever hole. No doubt that where he lived is one of the few districts which Mr. Eves, in his book, takes exception to.

The statistics given are sufficient, without running the risk of being tedious even to those who have no taste for them ; they are significant as showing the very great change which has taken place of recent years in the direction of the trade of the West Indies. The exports to this country have largely diminished, and the exports to the United States have greatly increased ; and where the exports go to, thence in time must the imports largely come from.

Where so much is good, it is not easy to make selections ; we, however, give a few extracts, which will give some idea of the book, which we can strongly advise all who have any interest in our possessions in the West Indies to buy and read.

The account opens with Barbados, which is probably the most healthy, and certainly the most populous per square mile of any of the

islands, and has, perhaps, passed through the sugar crisis of the past four years with less injury than any of them. Mr. Eves strongly urges the adoption of the Central Factory system, as shown by the following:—

Instead of 30,000, 40,000, or 50,000 tons (which latter used to be considered a very good crop), that of 1888 will reach to upwards of 70,000 tons. If the system of central factories, by which is meant a factory with the latest improvements and very best machinery, to work up the canes from a number of contiguous estates, could be established, the quantity of sugar would be still more largely increased, the quality improved, and the cost of manufacture reduced. This is the system which has been carried out with great success in the French colonies, and has also been fairly started in St. Lucia. Two or three sites in Barbados are particularly adopted for central factories. It is obvious that a single estate—and in this island the estates do not as a rule run to a very large extent—could not afford costly buildings and plant all to itself. Such a system could only be a success when carried out upon a large scale, with a constant and full supply of canes to keep the factories going. In some such scheme as this, indeed, lies the future prosperity of the sugar islands. Experts say that Barbados ought to turn out good sugar at a cost of £8 to £10 per ton, which, at a moderate price (and prices will rarely be very high again), ought to leave margin for sufficient profit. The value of exports from Barbados in 1887 was £1,063,397, and the imports £983,187, making a total trade of £2,046,584.—(Page 26.)

Mr. Eves gives a long chapter to Jamaica, and commences by reproducing the following story of the rough and ready description of it by Columbus:—

The story of Columbus crumpling up a piece of paper in his hand, and then showing it to Queen Isabella as a description of Jamaica, is so good and apposite that it deserves to be historically true if it be not so. It is, indeed, a “crumpled” country, of the most diversified beauty—hill and valley, mountain ridge and sheer precipice, rough fissure and romantic glen, the whole enlivened and animated with cascades, streams, and rivers of all sizes and forms.—(Page 47.)

This is what the author says of the climate of Jamaica:—

The climate of Jamaica promotes longevity. During day the refreshing sea breeze makes existence not only tolerable but exquisitely enjoyable. A moderate wind from the mountains keeps the nights deliciously cool. At a height of 225 feet above Kingston the mean yearly temperature is 78°, and it naturally falls according to the rise of ground. Dr. Phillippo, in his well-known book on the climate of Jamaica, says that even delicate invalids can live virtually in the open air, carefully avoiding, of course, chills and

draughts. The few insalubrious spots in the island, or an occasional outbreak of fever in Kingston, do not detract from the remarkable general healthiness. Once on the upper ground all fear of miasma is at an end. Nothing can exceed the bright life-giving influences of the air, to breathe which is an exhilaration. Nor is this account of the climate a theoretical exaggeration. The practical testimony of many who have derived real benefit from it could be brought forward. Those who would die if they remained in the fogs of London, or the snows and frosts of New York, obtain a fresh lease of life by spending the winter in Jamaica. For weak chests, unsound lungs, and bronchial disorders, the climate is peculiarly suited. The testimony of many medical men might also reassure the patient. The late Dr. Bowerbank, the principal physician for many years in the island said:—
“There can be no doubt that where a predisposition to tubercular and scrofulous diseases exist, a residence in Jamaica will completely check its further development, and even during the earlier stages of tubercular consumption, if its progress be not arrested, life is prolonged, and the disease divested of much of its suffering.”—(Page 50.)

And of Mandeville (in the parish of Manchester, and the county of Middlesex):—

The life and bustle of this town of Mandeville, with its many prosperous inhabitants engaged in fruit and corn growing and other pursuits, make it a pleasant epitome of Jamaica, while a month in its clear and healthy atmosphere is worth six months in any European resort, where the vital forces are wasted and burnt up over the excitement of gambling tables. Besides the articles already mentioned in connection with other parishes, ginger is produced in Manchester.—(Page 54.)

The following eloquent description of the five miles from Spanish Town to Bogwalk, Mr. Eves quotes from Lady Brassey's “The Trades, the Tropics, and the Roaring Forties,” (8vo edition, page 251):—

“Imagine everything that makes scenery lovely: wood, rock, water, and the wildest luxuriance of tropical foliage, mingled and arranged by the artistic hands of nature in one of her happiest moods, and then picture all this surrounded by lofty and abrupt precipices, with a back ground of the most brilliant blue, illuminated by the brightest of suns (the heat of which on the present occasion was tempered by a gentle breeze which rippled the surface of the river). The Bog Walk is a gorge through which the Rio Cobre flows towards the sea. As we passed out, the sides of the ravines became less precipitous, and were clothed with all kinds of tropical trees, such as the sloth, bread fruit, and bamboos, besides vast quantities of flowering orchids.”—(Page 68.)

From the effects of the law of 1846, equalising the duties upon free

grown and slave grown sugars, Jamaica, as a sugar-producing country, has never recovered :—

Railway schemes were projected, and to some extent carried out. But the home legislation of 1846, involving the equalisation of the duties on free-grown and slave-grown sugar, practically put the colonial productions at a great disadvantage in European markets. The sugar production fell to a point, from which it has never recovered. Estates worth their thousands a year became valueless. Estates that had to go into Chancery because the proprietors were unable to manage them, through incompetence of mind, dwindled away from their thousands of annual income, to a position in which they could not pay a small merchant's commission. Many profitable properties were thrown up, and large districts of the colony returned into bush.—(Page 83.)

And yet Jamaica has a great future before her :—

Jamaica has a great future, but in order to secure it, people in England must wake up to the fact of the value of the great possession, and people must send their sons, invest their money, exercise their influence, and enlarge their sympathy, so that the prosperity of the country may be assured, that it may contribute its proper proportion to the wealth of the world, and that the old bad days of struggle, selfishness, disaster, and cruelty may be forgotten in the dawn of a day the light of which shall shine upon a happy and contented people, living under fairer auspices and juster conditions than were ever known or enjoyed before.—(Page 92.)

Nowhere in the West Indies has there been displayed so much energy, or anything like the same amount of capital invested in the sugar trade of late years as in British Guiana. Of its climate the author thus speaks :—

The climate has been subject to much animadversion, especially by people who know nothing about it. It is hot, but certainly not unhealthy, a fact proved by the vigorous health enjoyed by many English planters who have spent a great portion of their lives in the colony. Men advanced in years have been known to retain all the physical and mental energy, together with all their capacity for work of all kinds, up to the very last. There may be an occasional epidemic of yellow fever, as there are analogous periods of fever, smallpox, and cholera in England. But this application of the law of diseases, from which no country in the world is free, does not militate against the general excellence of a particular climate. The bland, warm, and moist atmosphere is particularly adopted to cases of threatened or incipient phthisis (consumption) ; and even in a more advanced form of the disease, life would be prolonged in British Guiana.—(Page 113.)

He supplements his own opinion by that of Sir R. Schomburgk's :—

Sir R. Schomburgk, whose knowledge of the climate is beyond dispute, affirms that "the salubrity of the interior is proverbial, and there are many instances of longevity among the settlers on the banks of the rivers Demerara, Berbice, and Essequibo. The natural drainage is here so perfect, that all impurities are swept off by the torrents of rain, and the purity of the air is so great that the planets Venus and Jupiter may be seen in the daytime. While descending the Upper Essequibo, in December, 1838, we saw, one afternoon at three o'clock, the sun, the moon, and the planet Venus."—(Page 114.)

A great contributor to the great strides made in British Guiana, in the production of sugar, is Coolie labour; and what Mr. Eves says of this race, so far as British Guiana is concerned, is very pleasant reading:—

There are at the present moment more than 100,000 Coolies in the colony who have been introduced from the East Indies, or who are the children of those who have been so introduced. Upon the steady labour afforded by these people the colony has thriven. Without Coolie emigration the present cultivated portion would have been a land of swamps and ruined embankments, or perhaps washed over by the sea. The system of emigration, established about 1850 and elaborated through successive years to its present efficiency and completeness, has been amply demonstrated as beneficial to all parties. It is a release to the famine-stricken districts of India; it is good for the Coolie, because it makes a man of him by giving him an adequate reward for his industry; it is good for the planter, because he obtains that command of steady labour, upon which all his operations depend; the shopkeepers increase their business by the presence of a new, large wage-earning class; the negro has his share of the advantage, because he has opportunities of well-paid work, which he would not have if the estates had not been continued or fresh ones set going; and the Government and all the institutions of the country are better supported, in consequence of increased revenue, which follow an expansion of production and trade. Upon the whole, therefore, although not an increasing race in British Guiana, those of African descent are prosperous, and not by any means the least intelligent of similar communities of the West Indies.—(Page 124.)

The subject of "diffusion," as applied to the sugar cane, is one which engages a great deal of attention just now. The results of the experiments now being made by Mr. Quintin Hogg in Demerara, we give in another part (see page 353). Favourable as these figures appear, to our minds the success of the system is not as yet a *fait accompli*. The process of diffusion is thus described by Mr. Eves:—

The process of diffusion has recently been attracting much attention,

especially from the success which it has secured in the beet sugar factories of the continent of Europe. It might be thought, at first sight, that to cut a root like a turnip into slices, was an easier thing to do than to cut a fibrous plant like the sugar cane. But this difficulty has been overcome by scientific skill, especially in the construction of the knives to be used. The cane being cut into slices, and soaked into water, the crystallisable sugar in the juice will pass through the cells into the water, while the uncrystallisable part of the juice remains in the cells of the cane. This separation of the contents of the cane is diffusion. When the cane is sliced, it is automatically put into a series of open diffusers, the liquor flowing by simple gravity from one to the other, and connected with each diffuser is a steam chamber, by the effect of which the sugar is separated from the non-crystallisable elements of the juice in the cane. It is, indeed, a principle of purification at each step of the process; and as these steps progress, the identity of the sugar becomes more marked and recognisable, and capable of further process of being transformed into marketable produce. M. Robert's system has been known for many years in connection with the beet, and it is also the subject of experiment in different cane countries —(Page 140.)

In considering the reports of the results of the experiments now being made, it is well to keep before us some of the disadvantages of the system, as pointed out by Mr. Nevile Lubbock when speaking upon the subject of diffusion in 1887. The extract we give is from Mr. Eve's book:—

DISADVANTAGES OF THE DIFFUSION PROCESS.

1. Where mills now exist the money spent upon them is lost, and further capital must be sunk in diffusion plant.
2. A largely increased evaporation is required, involving considerable outlay of capital and increased working expenses.
3. The megass now obtained and utilised as fuel is lost.
4. Expense of getting rid of Schnetzel.
5. Expense of water required.—(Page 146.)

Mr. Washington Eves does not at all exaggerate the importance of the question of the abolition of sugar bounties as it respects British Guiana, or, indeed, any of our sugar colonies. If sugar growing should become so unprofitable as to be abandoned, the consequences to Demerara would be most serious:—

There is no new process but what has been tried there. This is the only way in which the beet industry can be kept pace with. Sugar is the staple of Demerara. The cost of producing a ton of sugar has been much reduced of late years, but this limit has now practically been reached. Without the foreign bounties the extra richness of the cane will tell, and the prosperity

of this colony be secured. As has been said above, all classes of the community depend upon sugar, and if this industry were, from any cause, allowed to decline or be destroyed, the consequences must be disastrous to the colony.—(Page 150.)

Trinidad used to be considered unhealthy; but this, Mr. Eves states, is not the case. Its healthiness, he says, is apparent from the men who have lived there; some English families having been on the spot for a long time. Our space forbids our giving what he says on this subject, but we must not omit his description of the Usine St. Madeleine, in this colony, erected by the Colonial Company:—

To see sugar making in connection with the most advanced processes, a visit should be made to the Colonial Company's famous usine of St. Madeleine. The canes are brought by tramways from the contiguous estates: they are crushed in the mill, the boiling and filtration processes of the juice are carried out, until, having passed through turbines, the fine crystals are produced. This usine of St. Madeleine can be easily reached by carriage from San Fernando or by the Cipero tram, which goes up from the coast. It is only about four miles from San Fernando. It is by far the best appointed institution of the kind in the West Indies. The usine is in the centre of some of the Colonial Company's best estates, for a constant supply of canes is necessary to keep the elaborate machinery going. The estates are connected with the usine by a system of railways or tramway. Engines and trucks are always at work upon these lines, carrying canes to be worked up, or sugar to the nearest point of the Cipero tramway, to be transported to the coast of San Fernando. Altogether there are about twenty-five miles of railway serving the purposes of this usine. The shops, too, for repairs, are a sight to see. The great mills, made by Fletcher, of Derby, the megass-burning boilers, the lifting apparatus, the vacuum pans and tripple effect vessels, the electric light, all make up a wonderful picture of the practicalities of sugar making in the present year of grace. All the elements of successful competition with the beet are here, and the work turned out is on the largest scale, the usine being probably one of the largest in the world. Every year sees the cost of production less. The cost has been reduced 50 per cent. during the last fifteen years.—(Page 184.)

Our space forbids us giving further extracts.

The other islands mentioned in the book are—Tobago, Grenada, St. Lucia, St. Vincent, Martinique, Dominica, Guadeloupe, Montserrat, Nevis, St. Kitts and Anquilla, Antigua, The Virgin Islands, Porto Rico, Cuba, The Bahamas, British Honduras, Surinam, Cayenne, and Hayti.

The volume contains numerous plates and maps, but is lacking in an index at the end—so useful for reference.

IMPORTS AND EXPORTS (UNITED KINGDOM) OF RAW
AND REFINED SUGARS.

JANUARY 1ST TO MAY 31ST, 1888-1889.

Board of Trade Returns.

IMPORTS.

RAW SUGARS.	QUANTITIES.		VALUE.	
	1888.	1889.	1888.	1889.
	Cwts.	Cwts.	£	£
Germany	1,585,829	2,904,619	1,075,362	2,362,351
Holland	121,149	205,096	83,518	157,583
Belgium	348,620	431,879	229,830	287,075
France	2,070	88,510	1,690	73,403
British West Indies & Guiana	1,090,074	1,034,264	890,281	939,544
British East Indies	354,958	347,354	172,745	224,228
China and Hong Kong .....	.....	.....	.....	.....
Mauritius	95,283	116,504	69,731	119,521
Spanish West India Islands	260,424	46,400	104,037	41,890
Brazil	1,630,064	655,493	1,037,518	461,405
Java	2,057,537	702,211	1,579,746	675,218
Philippine Islands	216,282	159,905	110,659	98,414
Peru	210,848	238,765	160,084	187,138
Other Countries	247,640	368,672	178,409	299,236
Total of Raw Sugars ..	8,220,778	7,299,672	5,783,910	5,927,006
Molasses	136,321	169,136	43,110	61,625
Total Sugar and Molasses .....	....	....	5,827,020	5,988,631
REFINED SUGARS.				
Germany	1,303,261	2,073,177	1,137,611	2,022,468
Holland	490,463	596,258	451,934	585,070
Belgium	93,499	117,719	89,442	118,767
France	369,492	603,984	335,150	601,749
United States	25,697	8,324	24,163	7,409
Other Countries	200,745*	397,050†	155,717*	350,932†
Total of Refined	2,483,157	3,796,512	2,194,017	3,686,395

EXPORTS.—REFINED SUGARS.

	Cwts.	Cwts.	£	£
Sweden and Norway	20,784	31,806	17,641	24,971
Denmark	29,298	49,932	21,372	38,352
Holland	32,494	36,310	24,162	26,825
Belgium	9,913	11,764	7,457	8,222
France	2,375	4,489	1,717	3,306
Portugal, Azores, & Madeira	36,326	24,067	27,033	17,437
Italy	35,019	34,862	26,065	27,761
Other Countries	67,888	57,732	55,433	48,271
Total of Exports	234,097	250,962	180,880	195,145

* Imported entirely from Russia.

† Imported almost entirely from Russia.

IMPORTS OF FOREIGN REFINED SUGAR.

The British Sugar Refiners' Committee furnish us with the following figures, giving the imports of foreign refined sugar for the month of May, 1889, compared with the corresponding month of the two preceding years, and the average monthly imports for the year compared with those of 1886, 1887, and 1888, distinguishing the quantities of "Lumps and Leaves" from "other sorts," and giving the separate imports from each country:—

Countries from which Sugar has been imported.	"LUMPS AND LOAVES."						"OTHER SORTS," Including Crushed Loaf, Granulated, Crystallized, &c.						TOTAL.								
	Monthly Average.			May.			Monthly Average.			May.			Monthly Average.			May.					
	Tons.	Tons.	Tons.	1887	1888	1889	Tons.	Tons.	Tons.	1887	1888	1889	Tons.	Tons.	Tons.	1887	1888	1889			
France.....	1462	1363	1088	1963	1661	1778	2263	2088	5099	4855	4076	4376	2202	6789	4150	6402	6511	6039	3980	9052	
Holland	3508	3760	3267	2961	3692	3518	2785	1428	2483	2675	3001	1831	1995	2710	4936	6263	5042	5962	5526	5495	
Germany & Austria ..	990	1347	1510	3041	2123	1511	3352	6434	10463	11729	17689	7638	16353	19466	7624	11810	13239	20730	9750	22818	
Belgium	344	592	622	915	507	517	598	113	308	227	261	331	161	237	457	900	849	1176	838	835	
United States	854	454	8	..	690	23	..	5078	2804	157	83	10093	727	24	5932	3258	165	83	10785	750	21
Russia.....	..	3	..	..	..	..	..	3412	452	1959	3829	..	418	2002	3112	455	1959	3920	..	2002
Other Countries .....	..	..	1	11	..	..	..	9	15	2	145	..	..	688	9	15	3	156	..	688
Total	7158	7539	7094	8691	8573	7377	8998	19362	21634	21604	29075	21272	21854	31916	26520	29163	28698	37066	32815	20231	40914

SUGAR STATISTICS—GREAT BRITAIN.

TO JUNE 22ND, 1889 AND 1888. IN THOUSANDS OF TONS, TO THE NEAREST THOUSAND.

	STOCKS.		DELIVERIES.		IMPORTS.	
	1889.	1888.	1889.	1888.	1889.	1888.
London	44	68	145	135	159	149
Liverpool ..	54	141	148	133	107	190
Bristol	3	3	32	24	32	22
Clyde	47	45	121	113	144	114
Total ..	148	257	446	405	442	475
	Decrease.. 109		Increase.. 41		Decrease.. 33	

SUGAR STATISTICS—UNITED STATES.

(From Willett and Hamlin's Circular.)

FOR THE FOUR PRINCIPAL PORTS. IN THOUSANDS OF TONS, TO THE NEAREST THOUSAND. FOR MAY, 1889 AND 1888.

	STOCKS.		DELIVERIES.		IMPORTS.	
	June 1st.		In May.		In May.	
	1889.	1888.	1889.	1888.	1889.	1888.
New York	20	120	71	57	77	77
Boston	1	17	27	20	27	26
Philadelphia....	3	4	17	19	20	20
Baltimore .....	..	..	..	..	..	..
Total	24	141	115	96	124	123
	Decrease.. 117		Increase.. 19		Increase.. 1	
Total for the year			490	405	481	499

NEW YORK PRICES FOR SUGAR.

From Willett, Hamlen & Co.'s Report, June 13th, 1889.

FAIR REFINING.	960/0 CENTS.	GRANU- LATED.	STAND. A.	STOCK IN FOUR PORTS.
June 13, 1889.—7c.	8c.	9½c.	8½c.	Jan. 1, 1889— 32,254 tons.
June 14, 1888.—4½c.	5½c.	6½c.	6½c.	Jan. 1, 1888— 47,798 tons.
June 16, 1887.—4 7-16c.	5½c.	5½c.	5½c.	Jan. 1, 1887—102,279 tons.
June 17, 1886.—4½c.	5½c.	6 3-16c.	5½c.	Jan. 1, 1886— 57,323 tons.
June 18, 1885.—5½c.	6½c.	6½c.	6½-¼c.	Jan. 1, 1885— 89,186 tons.
June 12, 1884.—4½c.	5 11-16c.	6½-9-16c.	6½-¼c.	Jan. 1, 1884— 60,900 tons.
June 14, 1883.—6½c.	7 11-16c.	8 13-16c.	8 5-16c.	Jan. 1, 1883— 50,297 tons.
June 15, 1882.—7½c.	8 1-16c.	9 7-16c.	8½c.	Jan. 1, 1882— 43,927 tons.
June 16, 1881.—7½c.	8½c.	10½c.	10c.	Jan. 1, 1881— 66,999 tons.
June 10, 1880.—7 9-16c.	8½c.	10c.	9½c.	Jan. 1, 1880— 63,558 tons.

STOCKS OF SUGAR IN THE CHIEF MARKETS OF EUROPE ON THE
31ST MAY, FOR THREE YEARS, IN THOUSANDS
OF TONS, TO THE NEAREST THOUSAND.

Great Britain.	France.	Holland	German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1889.	TOTAL 1888.	TOTAL 1887.
156	157	14*	68*	76	18	489	685	660

CONSUMPTION OF SUGAR IN EUROPE FOR THREE YEARS, ENDING
31ST MAY, IN THOUSANDS OF TONS, TO THE
NEAREST THOUSAND.

Great Britain.	France.	Holland	German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1889.	TOTAL 1888.	TOTAL 1887.
1313	447	40*	440	257	354	2851	2666	2726

ESTIMATED CROP OF BEET ROOT SUGAR ON THE CONTINENT OF EUROPE
FOR THE PRESENT CAMPAIGN, COMPARED WITH THE ACTUAL CROP,
OF THE THREE PREVIOUS CAMPAIGNS.

(From *Licht's Monthly Circular*.)

	1889-90.	1888-89.	1887-88.	1886-87.
	Tons.	Tons.	Tons.	Tons.
France.....	495,000 ..	470,000 ..	392,824 ..	485,739
German Empire ..	1,030,000 ..	990,000	959,166 ..	1,012,968
Austro-Hungary..	630,000 ..	525,000	428,616 ..	523,059
Russia and Poland.	535,000 ..	510,000 ..	441,842 ..	487,460
Belgium	145,000 ..	140,000 ..	140,742 ..	135,755
Holland	47,000 ..	45,000 ..	39,280 ..	36,098
Other Countries..	58,000 ..	55,000 ..	49,980 ..	49,127
Total....	2,940,000†	2,735,000	2,451,950	2,730,206

*Estimate.

†Mr. Licht wishes it to be clearly understood that these figures are not to be considered in the light of Estimates, and yet these *figures* as compared with those given a month ago, for 1889-90, show a reduction of 75,000 tons.

STATE AND PROSPECTS OF THE ENGLISH SUGAR MARKET.

Speculation in beet sugar has sent up the price of 88% 4s. 9d. per cwt. since 1st June; the advance since the 1st February is 14s. per cwt. In five months the price has more than doubled. It is now 28s. per cwt., and on 1st February it stood at 13s. 7½d. per cwt. The most remarkable feature of the sugar trade, at the present time, is the great disparity between quotations up to August, and after October—it being fully 11s. per cwt. The quotations for November and December are 16s. 9d. to 16s. 10½d. per cwt.; another remarkable feature is the great increase, in the face of the high prices, in the consumption, as shown by the deliveries, both in this country and in the United States; part of the increase is no doubt due to the larger stocks being held by retailers.

The stocks in this country and in the United States show a decrease, as compared with a year ago, of 230,000 tons. It now seems quite possible that those who predicted that 88% beet will touch 30s. per cwt. before the new crop comes in, may prove to be right.

The advance in cane kinds during the month is from 1s. to 2s. per cwt., and refined goods are up to 2s. to 2s. 6d. per cwt., the market for both raw and refined closing very firm.

The imports of foreign refined, in May, were 40,914 tons, against 29,231 in May, 1888; for the five months the totals are: for 1889, 189,848 tons, and in 1888, 124,159 tons; or an excess of imports for the present year of 65,689 tons.

The deliveries into the United Kingdom (four principal ports) up to June 22nd last, show an increase over same period of 1888, of 40,969 tons, and the imports a decrease of 33,472 tons.

The stocks in the United Kingdom (four principal ports) on June 22nd, were 148,411 tons against 256,985 tons in 1888, or a decrease of 108,574 tons.

Present quotations for the standard qualities, as under, are:—

FLOATING.		Last Month.
Porto Rico, fair to good Refining	21/- to 22/6 against	19/9 to 21/6.
Cuba Centrifugals, 97% polarization .. .	24/3 to 24/6 ..	22/- to 22/3.
Cuba, fair to good Refining	21/6 to 22/- ..	20/- to 20/6.
Java, No. 14 to 15 D.S.	24/9 to 25/3 ..	22/9 to 23/3.
British West India, fair brown .. ..	.. ..	18/- to 19/6.
Bahia, low to middling brown	16/- to 17/6 ..	14/6 to 16/-.
„ Nos. 8 to 9	18/3 to 19/- ..	17/3 to 18/-.
Pernams, regular to superior Americans ..	17/- to 19/6 ..	16/6 to 19/-.
LANDED.		Last Month.
Madras Cane Jaggery	13/6	against 12/9 to 13/-.
Manila Cebu and Ilo Ilo	13/6	„ 13/- to 14/-.
Paris Loaves, f.o.b.	26/-	against 24/-
Russian Crystal, c.i.f.	25/6	„ 23/6
Titlers	28/6	„ 26/3
Tate's Cubes	29/-	„ 26/3
Beetroot, German, 88%, c.o.b.	28/-	„ 23/3

THE SUGAR CANE.

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 The writers alone are responsible for their statements.

N.B.—All communications to be addressed, and Cheques and P.O. Orders made payable to HENRY THORP, Ducie Chambers, 57, Market Street, Manchester.

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Sir William Robinson, Governor of Trinidad, arrived in this country on the 11th ult., on a six month's leave of absence.

The Times, in its notice of the exhibits at the Jubilee meeting of the Royal Agricultural Society at Windsor has the following respecting artificial manures:—

“Another large industry which has grown up during the last fifty years, is that of the artificial manure trades. It is not generally known that the present year is the jubilee year of the introduction of guano, the first crop having been landed in this country in 1839. The Anglo-Continental (late Ohlendorff's) Guano Company have therefore prepared for the show an interesting exhibit, and also a pamphlet by Mr. Herman Voss,* explaining and recording the history of its use for fifty years. Other noteworthy and instructive manure stands are those of Odams' Manure Company, Messrs. Proctors & Ryland, and the Native Guano Company.”

The Agricultural Company of Mauritius, Limited, have declared a dividend of 10 per cent. for the past year. The net year's profits amount to £14,488, which added to the balance brought forward from the previous year, makes £15,793. Of this sum £14,025 is absorbed by the dividend of 10 per cent., leaving £1,768 to be carried forward to next year.

According to the *Sydney Trade Review*, a new sugar refinery is to be started in Melbourne, one-half of the necessary capital for which has been found in the colony, and the rest in London.

* Which we have noticed at page 427.

We learn from the *Sterling Champion*, Kansas, U.S.A., that the Sterling Syrup and Sugar Company are arranging to put down a Concretor in their works. We have not heard very much about the Concretor for some years, and shall be much interested in learning the results of their experiment, which, if we mistake not, is the first in the United States.

At a meeting held in Bristol on the 17th ult., of the general committee of the Workmen's National Association for the abolition of the Foreign Sugar Bounties, when the following resolution was adopted :—

“ That this meeting while deeply regretting the withdrawal for this session of the Sugar Convention Bill, hereby declares its unabated confidence in the intentions of Her Majesty's Government to carry the same early in the next session of Parliament; and further, that we are determined to continue the agitation in support of the Bill with renewed vigour until Parliament reassembles in February next.”

The following figures, which have been furnished us by an obliging correspondent in New York, are taken from Government returns, and show for the years named, the production of sugar, other than cane, in the United States :—

	Maple. Tons (2,000 lbs.)	Beet. Tons (2,000 lbs.)	Sorghum & other. Tons (2,000 lbs.)
1877	1,554
1878	1,377
1879	1,443
1880	357	19,43
1881 9,000	...	629	not given.
1882 20,000	446	..
1883 18,500	536	..
1884 25,000	737	313
1885 25,000	600	1,400
1886 18,000	..	754	not given.
1887 20,000	... not given	..	..
1888 20,000	1,640	360

Maple sugar is sold in the candy form, and its production, it is stated, is not likely to increase.

The beet industry has not yet passed the trial stage—if the present import duties are continued, it *may* pay.

Respecting sugar from sorghum, we are not amongst those who believe that it will become a permanent “industry.” Kansas State

gives a bounty of 4s. 8d. per cwt. (1c. per lb.) upon sugar so produced, which, in addition to the 10s. per cwt. protective duty, will stimulate enterprise. An industry, however, which is dependent upon such aids, is at best a very precarious one.

We also give the Louisiana production, which added to the foregoing, makes up the entire domestic production.

	Tons.		Tons.
1877	72,000	1883	124,000
1878	130,000	1884.....	95,000
1879	94,000	1885.	130,000
1880	122,000	1886.....	82,000
1881	69,000	1887.....	158,000
1882	85,000	1888.....	140,000

In connection with the figures given above, it may be of some interest to give the consumption of sugar (as shown by the imports, and domestic production), in the United States during these years.

	Tons.		Tons.
1877	745,000	1883..	1,008,000
1878	791,000	1884.....	1,205,000
1879	806,000	1885.....	1,245,000
1880	917,000	1886.....	1,389,000
1881	861,909	1887.....	1,397,000
1882	979,000	1888.....	1,470,000

Detailed reports of the working of some of the large German sugar manufacturing companies are now coming to hand, and we give extracts from two of these, relating to the operations of factories which may be considered representative. In making any comparison with former years it must be remembered that the tax on beets is now 45pf. per cwt. less than it was previous to August 1st, 1888.

The factory of *Strassburg u/M* has a capital of M. 750,000. During the campaign lasting from 20th September, to 19th December, 1888, it worked up 664,375 centner (= 1 cwt.) of beets, which were grown on 5,773 morgen, giving an average of 115 cwt. per morgen (the morgen = acre). The saccharine content was considered satisfactory. The beets suffered somewhat from frost, and consequently the production was rather curtailed. Including tax, working costs, &c., M. 900,000 were paid for beets, 1 cwt. thus costing M. 1.98, viz.: beets 95½pf., tax 40pf., working expenses 62½pf. The yield of sugar

was close on $13\frac{1}{2}$ per cent. of the weight of beets. The gross profits were M. 233,108. The amount written off for depreciation, &c., in accordance with legal requirement, was M. 171,873, leaving a net profit of M. 61,235. Of this 10% goes to reserve fund; 4% as a preference dividend on M. 30,000; 10% of the remainder as bonus to the employés; leaving M. 22,600 for disposal at the general meeting of shareholders.

Körbisdorf has a capital of M. 2,700,000, and possesses farm lands on which beets, wheat, potatoes, &c., are grown. The agricultural part of the undertaking shows a gain of M. 281,680, against M. 115,380 last year.

This factory worked up 648,020 centner of beets, over two-thirds being home grown. The beets cost $96\frac{1}{4}$ pf. per cwt. The saccharine content was 13.080 per cent. The sugar (of all kinds) obtained was 11.213 per cent., being about 10% less than last year. The gross profit on the sugar factory was M. 181,493. The net profit on the whole undertaking, including M. 10,770 from a coal mine, and a balance from last year of M. 2,714, (after writing off for interest M. 109,425, discount M. 19,124, trade expenses M. 37,500, and depreciations, &c., M. 26,809), amounted to M. 225,158, of which M. 135,000 go to pay 5% dividend, M. 22,238 to reserve fund, M. 50,000 to new building account, M. 16,516 as bonus to director and managing committee, and M. 1,403 to new account.

We continue our reports of the net results of the working of various other factories for which we are indebted as usual to the *Deutsche Zuckerindustrie*, and other journals.

DIVIDENDS DECLARED.

Wallwitz, which for some years paid no dividend, pays M. 3,000 per share of M. 2,450; last year the amount was M. 5,000. During the last five years it has erected and paid for new buildings and machinery at a cost of M. 400,000, which reduce the working expenses from 70pf. to 38pf. per cwt. of beets. *Camburg* declares 22%; *Vechfelde*, 20%; *Cönnern*, 10%; *Möscherin* (share capital M. 596,000), 10%; *Dirschau*, 15%; *Glauzig*, $7\frac{1}{2}$ %.

PROFITS SHOWN.

Schlade (capital M. 800,000) has made a net profit of M. 324,470; *Wabern* (capital M. 600,000), M. 208,587; *Altenau bei Schoppstedt* (share capital M. 450,000), M. 118,732; *Wierzchoslawice* (capital M.

1,002,000), M. 97,286; *Papenteich* (capital M. 410,000), M. 90,719; *Wierthe* (capital M. 270,000), M. 79,205; *Linden-Hannover* (capital M. 464,000), M. 70,827; *Harsum* (capital M. 675,000), M. 27,976; *Gronau* (capital M. 360,000), M. 22,389; *Oelsberg* (capital M. 270,000, mortgage loan, M. 300,000), M. 15,380; *Lehrte* (capital M. 263,400), M. 14,154; *Weitzen* (capital M. 750,000) shows an apparent loss in figures of M. 5,457, the actual gain however is tolerably large, and is to be found in the high prices paid to the shareholders* for beets. *Uslar* (capital M. 360,000, mortgage loan M. 375,000), has made only M. 1,035; *Neuhaldslieben* (capital M. 900,000) the gross profit, only M. 47,000, is almost entirely absorbed by the depreciation and interest fund; *Oschersleben* (capital 720,000), gross profit M. 57,142, absorbed by depreciation, excepting M. 3,000 placed to reserve fund; *Dingelb* (capital M. 420,000), the net surplus of M. 44,641 is handed over to the beet contractors.

The only loss reported is that of *Equord* (capital M. 192,900), viz.: M. 2,166.

In Bohemia:—The *Predmeric* factory declares a dividend of 20%.

In Belgium:—The *Schooten Co.*, Antwerp (capital frs. 250,000), has made frs. 30,266, reducing the debit balance from former years to frs. 67,893. *Fleurus* (capital frs. 1,000,000), has only made frs. 141. *Feluy-Arquennes* (capital frs. 760,000), has gained frs. 105,941. The number of Belgian factories at present is 103. New factories are to be erected at *Oreye* (Liège), and *Ladeuze* (Hennegau).

In Holland:—The *Wester Suikerraffinadery* of Amsterdam worked up 31,000 tons of sugar in 1888, being slightly less than last year, and pays a dividend of 6%.

In Russia:—The *Ibrutch* factory, which was standing last year, is to be started again, and there will shortly be 221 factories at work.

In Cuba:—The large central factory of Constantia, in Cuba, this year has reached the highest figure of production it has ever attained, viz., 15,750 tons.

By way of stimulating us to home fruit growing, which is not nearly so extensive as it ought to be, the Lord Mayor of London has stipulated with the Fruiterers' Company, that all the fruit which,

* These shareholders contract to supply beets at a certain price, with a share in the eventual profit or loss. In the report of this factory, the cost of the beets includes the amount of profit apportioned to these contractors.

according to ancient custom, they may be pleased to present to him and the Lady Mayoress in September next, shall be of English and not of foreign growth.

An important discovery, it is stated, has been made by General Grant Wilson, who in his search for information relating to his wife's ancestry, has, at The Hague, come across the documents under which the island of Manhattan was purchased by the Dutch West India Company from the native Indians.

A letter announcing the purchase for 24 dollars, gave the clue to further search, and the deed itself, which has been hidden away for 263 years, has been unearthed. As New York City now covers the whole of Manhattan Island, the interest of this discovery may be imagined—if true.

A Cambridgeshire farm of 202 acres, which a few years ago was purchased for £10,000, and has since had £3,000 spent upon the homestead, has, it is stated, just changed hands at Wisbeach for the sum of £3,850—a reduction upon the previous cost of 60 per cent. Agricultural land in England has fallen in value during the past thirty years some 40 per cent.; so that there must be in this particular case some unusual conditions attached to the sale to account for this large depreciation.

It would appear from the Board of Trade Returns that, whilst there have been fewer paupers in this country than at the present time, yet in proportion to the population the number has never before been so small. A decrease is shown in all parts of the Kingdom, except in the agricultural districts of Leicester, Rutland, Lincoln, Nottingham, and Derby.

On June 19th, the Supreme Court granted to the official receiver of the Electric Sugar Company leave to sue Howard, Mrs. Friend, and others who were implicated in this fraud. The object of the suit is to obtain the cancellation of all the late Company's stock now in their hands, and to recover all monies which they obtained from the Company, or which the Company expended in consequence of fraudulent representation.

ON THE METHOD OF DETERMINING THE QUANTITY OF RAFFINOSE IN RAW SUGAR.

Communicated to the *Cöthen Chemiker Zeitung*, by Mr. THEODOR BREYER,
New York.

With remarks thereon by Dr. T. L. PHIPSON, F.C.S.

We frequently receive enquiries as to the manner in which the raffinose contained in raw sugar is ascertained here. I conclude, therefore, that the publication of the method employed by us here will be of interest to many of your readers.

For the purpose of inversion, 50 cm. of the liquid for polarisation (26.048 gr. to 100 cm.) are placed in a small retort of 50 to 55 cm. capacity; to this are added 5 cm. of hydrochloric acid, specific gravity 1.182. The retort is placed in a roomy water-bath, heated to about 70° C. At the same time another small retort, of 50 to 55 cm. capacity, filled with water and containing a thermometer, is placed in the water-bath. The temperature is regulated so that this thermometer shall show a heat of 68° to 69° C. during five minutes. About five minutes are required for heating the water to this temperature.

After inversion has been effected, the sugar solution is rapidly cooled by being placed in cold water, and is then left untouched for some hours in the room where the polarisation is to be effected.

After being accurately filled up to the mark, and, if necessary, decolorised by 0.2 to 0.5 gr. of bone black, treated with hydrochloric acid and dried,—filtration into a covered cylinder is effected by means of a filter kept carefully covered. The solution is placed for polarisation in a glass tube, which has a wide tube attached for the thermometer.

The apparent saccharine content in cane-sugar is calculated from the polarisation, before and after inversion, and from the thermometer reading, by Clerget's formula. Should there be a difference of 0.5 or over, the presence of optically active substances other than cane-sugar is considered to be indicated. If the content in cane-sugar ascertained by Clerget's formula is inferior to the direct polarisation, and if no substances which reduce Fehling's solution are present, then the true content in cane-sugar is calculated according to the following formula, which is a combination of those of Clerget and Creydt.

It may be objected that in calculating in this manner, the constant figure determined by Creydt for inverted raffinose solutions at the temperature of 20° C., and with a concentration of 16·75, is assumed as being applicable to other temperatures and concentrations. This objection may be met as follows :—

The products of the inversion of raffinose are levulose, galactose, and, perhaps, dextrose.

In Creydt's formula the effect of the concentration is disregarded. But this can only be very slight, as is evident from Meissl's formula for the specific rotatory effect of galactose. As there still remains after inversion a considerable power of right-hand rotation, and as galactose at moderate temperatures only rotates the ray a little more to the right than levulose does to the left, there must be more galactose than levulose present. The right-hand rotation of galactose and the left-hand rotation of levulose are decreased by raising the temperature. The two rotatory powers thus partially neutralise each other. The effect of temperature on the rotatory power of galactose is inferior to its effect in the case of levulose, but, on the other hand, there is more galactose than levulose present. For this reason we shall not get far wrong in assuming that the rotatory powers produced by changes of temperature about equalise one another.

The direct experiment confirms the above supposition. The rotatory power of an inverted solution of raffinose is inferior at a low temperature to that at a high temperature, but is by no means dependent on temperature to the same extent as an inverted cane-sugar solution. As raw sugars contain a proportionally small amount of raffinose, the correction necessary for temperature may, within certain limits, be disregarded. If it should be desired to take this correction into account, then the formula $46\cdot7 + \frac{t}{5}$ will come tolerably near to the truth.

The calculation will then be as follows :—

	Cane-sugar.	Raffinose.
A Direct polarisation.....	+ 100	.. + 100
B Polarisation after inversion at t°	— (44 — $\frac{t}{2}$)	+ (46·7 + $\frac{t}{5}$)
C Difference per 1° of original polarisation	$\frac{100 + 44 - \frac{t}{2}}{100}$	$\frac{100 - 46\cdot7 - \frac{t}{5}}{100}$
(1) A = Z + 1·85 R		
(2) C = $\frac{144 - \frac{t}{2}}{100}$ Z + 1·85 R	$\frac{53\cdot3 - \frac{t}{5}}{100}$	

$$\begin{aligned}
 (3) \quad & \frac{53.3 - \frac{t}{5} A}{100} = \frac{53.3 - \frac{t}{5} Z}{100} + 1.85 R \frac{53.3 - \frac{t}{5}}{100} \\
 (2-3) \quad & C - \frac{53.3 - \frac{t}{5} A}{100} = \frac{144 - \frac{t}{2} Z}{100} - \frac{53.3 - \frac{t}{5} Z}{100} \\
 & C - \frac{53.3 - \frac{t}{5} A}{100} = \frac{100 C - (53.3 - \frac{t}{5}) A}{100} \\
 Z = & \frac{144 - \frac{t}{2}}{100} - \frac{53.3 - \frac{t}{5}}{100} = \frac{144 - \frac{t}{2} - 53.3 + \frac{t}{5}}{100} \\
 & = \frac{100 C - (53.3 - \frac{t}{5}) A}{90.7 - 0.3t}
 \end{aligned}$$

The above alteration of Croydt's process was required to meet local circumstances, as, with the very high temperature and at the same time very large amount of moisture in the atmosphere, polarisation at 20° C. can only be effected with great difficulty, owing to the glass becoming cloudy. In addition, the process thus altered evidently admits of very rapid working.

REMARKS ON MR. BREYER'S PAPER.

TO THE EDITOR OF THE "SUGAR CANE."

Dear Sir,—I have read with interest the ingenious paper by Mr. Theodor Breyer, of New York, on the determination, by optical method, of the quantity of raffinose in raw sugar. It appears to be quite correct, but for many years past I have been accustomed to distrust, more or less, all methods of analysis based on optical (polarisation or colorimetric) tests.

The curious principle, Raffinose, which is *almost tasteless*, though a true sugar, appears to have been discovered by M. Loiseau in 1882, and has hitherto only been met with in raw beet root sugar. It is supposed to require 15 per cent. of water in order to crystallise, and to contribute in a marked degree to the formation of molasses. G. Burkhardt determines its amount in raw sugar or syrups in the following manner:—

The raw sugar, or the syrup dried up with sawdust, is extracted with methyl alcohol. This is distilled off, the residue diluted with water and boiled for twenty minutes with sufficient hydrate of strontia to cause the separation of granular *raffinose-saccharate of strontia*. The precipitate is separated, washed with boiling strontia solution,

and decomposed by means of carbonic acid. The solution is evaporated down, and on warming with alcohol, raffinose crystallises out. This is the simplest method with which I am at present acquainted. If the optical method of Mr. Breyer is accurate, it is still simpler. It has all the appearance of having been very carefully worked out, but it will be necessary to compare the results with those obtained by the gravimetric process.

Yours faithfully,

T. L. PHIPSON.

THE MAGDEBURG SUGAR EXCHANGE.

The Prager Zuckermarkt gives the following report of the collapse in prices which took place at the end of the second week in July, and the difficulties of the *Hausse-Consortium* (combination for a rise).

“The universal opinion is that the crisis was brought about at the outset by heedlessness, next by a combination of accidental circumstances, and, finally, by sheer stupidity. Ever since March, the members of the *Consortium* had been accustomed to receive money at every settlement, and, convinced as they were of the excellent statistical position of the article, they regarded any outflow of money as quite out of the question; consequently they neglected the most ordinary rule of commercial precedence, viz.:—to keep money ready for any eventual drain on the funds, and locked up their profits completely in the purchase of goods. Even then, all might have gone off well, if they had not made mistakes of another description. They contemplated the despatch of a parcel of 200,000 sacks of sugar to America, and the bargain had already been concluded on both sides three weeks before; the only thing remaining unsettled was a difference in freight of 1s., and they bargained about for 14 days in Hamburg over this 1s., in consequence of which, not only precious time, but also the funds which were intended to be supplied by the timely conclusion of the American transaction were lost. The beginning of July, therefore, found them destitute of the necessary means. Then came an occurrence which in itself would have been of no moment, but the consequences of which were fatal.

“The Hamburg market was on the whole a scene of ‘bear’ operations; the contrary party being only slightly represented, though the *Magdeburg Consortium* had a special agent who operated for them in that place. On the 10th July, this representative took a journey to Magdeburg, and the ‘bear’ operators took advantage of his absence to

run down the price to 27 marks; this was, of course, telegraphed to Magdeburg, and gave the first impulse to the panic there. To this must be added difficulties with the banks, who, when applied to, proved unwilling to grant the credit desired; upon this, the parties concerned lost their heads, and apathetically allowed matters to take their own course, although funds might still have been provided. Thus, for example, a prominent member of the *Consortium* possessed a large refinery, in which were lying 4,000 tons of white sugar, free from any lien, on which money might have been raised sufficient to meet the first rush.

“We learn, however, that the want of clear perception became still more evident, and finally went so far, that the *Consortium* declined the purchase of 2,000 tons of sugar that was offered to them. This was, of course, at once communicated to Hamburg, and, on the afternoon of the 10th, sugar was quoted there at 24 marks, and in the evening at 22 marks. The people at Magdeburg remained absolutely inactive in face of this; from the 10th to the 12th, the *Consortium* made no bid whatever, and in so doing, they administered to themselves the *coup de grace*.

“Not till then did they take steps, which, had they been resorted to in time, would perhaps have kept everything right, while at present, in the most favourable case, all that can be done will be to come out without any very great loss.”

A meeting of all concerned has since been held, matters have been fully gone into, and a committee chosen to settle affairs, paying for the present 25 % of all claims, and the remaining 75 % in full by 15th September.

At the meeting, a prominent representative of the other party bought on the spot 75,000 sacks of sugar at 24 marks, the same price has been paid in other cases, and the general opinion is that prices will again rise considerably during the next few days. It is reported that there will be a surplus over indebtedness of more than M1,000,000.

The *Consortium* appears to have re-commenced operations, not, in the opinion of the *Deutsche Zuckerindustrie*, to the advantage of the industry. Fortunately, the statistical position of sugar for the coming campaign is so favourable, that the temporary restriction of the consumption, which is the immediate consequence of these operations, cannot have any important effect on it.

INTERNATIONAL SUGAR BANK.

From the *Deutsche Zuckerindustrie*.

For some time we have been hearing of a Sugar Bank, to be established in London with a capital of no less than £3,000,000, which is to deal with the sugar business of pretty nearly the whole world, and even aims at regulating the production of individual countries.

We have always felt considerable doubts as to the possibility of such a bank existing or continuing to exist, and our doubts are not removed by a report, published in the *Kölnische Zeitung*, and copied into many political journals, of a meeting held at Brussels on the 15th inst., for the purpose of establishing such a bank. The report, which we copy from the *Vossische Zeitung*, sounds promising, but it will be noticed that, with the exception of the Belgian deputy, who was so obliging as to take the chair, no names whatever are mentioned, whilst it is stated, amongst other things, that "first-class London banking-houses will undertake the raising of the first million sterling."

According to enquiries which we have made in London, the founders are "unknown great men."

"A meeting, summoned by the International Sugar Syndicate, has been held in Brussels, for the discussion of a scheme for founding an International Bank for the Sugar Trade. M. Puissant (Belgium) presided. Representatives of prominent persons concerned in the sugar business in various European countries were present.

This Bank, "The International Sugar Banking and Trading Co., Limited; Head Office in London," is to be established with a capital of £3,026,000. First-class London banking-houses are ready to undertake to find the first million; half a million is to be reserved for shareholders connected with the sugar trade; and the remainder is to be open for public subscription. According to the *Kölnische Zeitung*, the bank is designed primarily to act as intermediary in developing business between different countries; disposing of superfluous quantities of raw, or, as the case may be, refined sugar in countries where demand may exist. Further, as appears from the discussion, producers of sugars in most countries will, by means of the new bank, be able to obtain loans on their produce at lower rates of interest than those hitherto paid. By the regulations the bank is

to be precluded from doing business for its own account, which indicates that it cannot form a "Ring" for artificially controlling prices, the object being rather to work adversely to the formation of such "Rings." It will also transact business with manufacturers who are not willing to become shareholders. By the establishment of branch institutions in different countries, the management of which will be committed to local government officials, it is intended to secure a due representation of the various interests on the general board in London.

The *Sucrerie Belge* gives the following names of those present at the meeting at Brussels:—MM. Douglas Onslow, President of the London International Sugar Syndicate (Limited); Oldfield, director, and Hirschberg, representative of the Syndicate; Jos. Goerz, of Berlin; Leopold Peill, of Düren (Rhenish Prussia); Count Stanislas Wodzicki, of Czarnsmin (Posen); Wenceslas Wernicki, of Warsaw; Van Hooft (*editor of the Esprit Pratique*, Paris); Victor Beauduin (*editor of the Sucrerie Belge*); Albert Puissant, Eugène Meeus and Victor Van Volsem, president and vice-president, and member respectively, of the Association of Sugar Manufacturers of Belgium.

A M. Lutz, of Rouen, a member of the Syndicate, also appears to have been present, and to have explained the objects of the Association.

The *Sucrerie Indigène* says:—"Neither with 75 millions (francs), nor twice, nor four times this sum, nor more still, can the quotations of an article like sugar be controlled in the markets of the world, in face of the facilities of communication and transport which now exist; this undertaking is a dangerous and Utopian scheme, which can at most have only an ephemeral success, introducing as it would do a fatal poison into the vitality of commercial transactions, which can only be controlled by the immutable law of supply and demand."

SAN FRANCISCO.—The imports of sugar into San Francisco for the first five months of 1889 amounted to 83,664 tons, of which 69,807 tons came from the Hawaiian Islands, 11,215 tons from Manila, 1,892 tons from Java, 569 tons from Central America, and 180 tons from China. It is said that the Hawaiian Sugar Stock Companies are paying good dividends, and the stocks are in active demand.

LORD SALISBURY ON THE SUGAR CONVENTION BILL.

On the 16th July Lord Salisbury addressed a meeting of the seven divisions of the Tower Hamlets, and the two divisions of West Ham, in the Beaumont Hall, Mile End Road, and in the course of his speech made the following allusions to the Sugar Bounty question:—

“He would venture to say a few words respecting the address, and he would take, first of all, the case of the sugar bounties. They had heard a great deal about these. To his extreme surprise the Government were being accused of having raised the price of sugar by reason of a treaty which would not come into operation for two years. It was rather like the fable of the wolf and the lamb—the lamb drinking some distance down the stream was accused of fouling the stream for the wolf which was drinking above. He thought they should rather attribute any rise in the price of sugar to the action of the bounties themselves, the result of which had been to drive back capital and industry in one case after another, until the natural sources from which the supply of sugar came had contracted, and, of course, there was a tendency in the price of sugar to rise. It was for the purpose of preventing this arbitrary and capricious rise in the price of sugar, that the Government had been so anxious to come to some fair international arrangement on the subject. One thing he might allude to in that connection. He observed that their opponents were very severe upon them because they tried to stop the artificial bounties, which their opponents said caused cheapness of sugar. They had tried to induce other countries to give up the bounties, and to a certain extent they had succeeded. It was said that they ran the risk of serious difficulties with France which might affect other branches of their commerce. Now, they could not stop bounties unless there was a general agreement, because if one Power gave them up all the advantage would go to the pocket of another Power that went on with the bounties. Therefore it was necessary to come to some general agreement. The co-operation of France in this matter had not been disregarded. The convention was not signed until their adhesion to it was obtained in principle, and the Government always trusted that she would join it, because she was more interested in joining it than any other Power. The Government of France spent three millions and a half sterling every year in giving bounties to the sugar producers, and it was more to the interest of France to put a stop to that system, and he entertained the earnest hope that she would rally entirely to their policy.”

ESTIMATE OF SUGAR BOUNTIES.

SIR T. H. FARRER *versus* MR. R. GIFFEN.

The following letter from Sir T. H. Farrer is in reply to Mr. Giffen's letter which we inserted in last month's *Sugar Cane*, page 338:—

TO THE EDITOR OF THE TIMES.

Sir,—In a former letter I said that a cursory perusal of Mr. Giffen's letter in your number of the 26th of June did not clear up the puzzle I felt in reading his official report. Further consideration confirms this conclusion, as the following remarks will show. If I have misunderstood Mr. Giffen he will correct me.

The following are admitted facts. The French and other Governments when they levy a tax on sugar levy the greater part of it on the raw material used in making the sugar. For the purpose of arriving at the amount to be levied on the raw material, they estimate the quantity of raw material which will produce a given quantity of sugar, and then levy on that raw material the tax which they propose to lay on the quantity of finished sugar which it is estimated to yield. For instance, if the tax on a ton of sugar is to be £20, and the quantity of raw material estimated to yield a ton of sugar is 100 tons, they levy a tax of £20 on 100 tons of raw material. When the sugar is exported they give back on every ton of sugar exported the whole tax of £20. If the estimate of the yield were correct no difficulty would arise. But the estimate is not correct, for the actual yield exceeds the estimated yield. Taking the above figures as an example, 100 tons of raw material does, in fact, produce much more than one ton of sugar; and the Government in giving back the tax of £20 on the export of a ton of sugar give back more than they have received on the 100 tons of raw material of which that sugar is made. So far the facts are acknowledged by us all.

But on these facts Mr. Giffen builds the following hypothesis. He says, if I understand him, the difference between the legal or estimated yield and the actual yield, is an "excess or surplus of sugar" which is not taxed at all; and that the French producer either sells this surplus for consumption in France untaxed, or, if he exports it, receives back as a free gift from the Government the whole of the tax, so that, whether sold at home or abroad, this surplus sugar escapes taxation. He goes on to explain the process by saying that the French producer is induced by the bounty on exportation, to export, and that this exportation raises the price of sugar in France till he "realizes the same bonus from the excess passing into consumption at home, as he realizes from what is sent abroad." Arguing from this hypothesis, Mr. Giffen, in his report, arrives at the following very remarkable conclusions, viz.:—(1) That the French bounty on export in 1887 was £20 a ton, or considerably more than the price of sugar in the English market, which was about £16 a ton. (2) That notwithstanding this enormous bounty France did not export the whole of her surplus of untaxed sugar, which, according to the report, amounted to 200,000 tons, but retained 41,000 tons for home consumption. To retain this in France, the price of all

sugar in France, must, to use Mr. Giffen's words, have been raised to a point "which would enable the producer to realize the same bonus from the excess passing into consumption at home as he realizes from what was sent abroad"—viz., £20 a ton or thereabouts. In other words, the effect of the French bounty in 1887, must, according to Mr. Giffen, have been to raise the price of sugar in France, which already included, besides the cost and profit on production, the heavy domestic tax, by an additional sum of about £20 a ton, and that at a time when the price in England was about £16 or £17 a ton. (3) That whilst France, with an export bounty of £20 a ton, exported only 159,000 tons of her surplus untaxed sugar, and retained 41,000 tons of it for her own consumption, Germany, with an export bounty of only £1 12s. per ton, exported 619,000 tons, of which 250,000 tons only were "surplus or untaxed sugar."

Is it surprising that many of us should be startled by such conclusions, or that we should be led to question the hypothesis on which they are based?

In truth Mr. Giffen's "surplus or excess of sugar which escapes taxation" is a creature of the imagination. There is really no such thing. If we look at the facts it is plain that all sugar which is made in France is taxed, whatever its destination. The French duty is levied on every hundredweight of raw material, and consequently on every hundredweight of sugar made out of that raw material. As regards domestic consumption, the effect of taxing the raw material on an estimate of the yield which is less than the actual yield is, not to exempt any particular sugar from taxation, but to make the tax on all sugar less than it would be if the estimate were correct. As regards exports, the effect is to give to the exporter, and through him to the foreign consumer, a bounty equal to the difference between the whole nominal tax (say) £20 a ton, repaid as drawback, and the tax which has actually been paid on the raw material of which the sugar is made. To speak of this system as a bonus on production is misleading. All depends on the circumstances. The introduction of such a system as France, out of rivalry with Germany, adopted in 1884, may operate as a reduction of taxation and consequently as a stimulus to production, or as an increase of taxation and consequently as a discouragement to production, according as the aggregate charge on sugar under the new system (after allowing for outgoings in the shape of bounties) is less or greater than the aggregate charge under the old system. The real and necessary consequences of the system are what I have always referred to—viz., first, that the amount of the tax realised by the French Government is less than the amount they would have received if each ton of sugar had paid its nominal tax; secondly, that the amount by which the drawback or nominal duty exceeds the actual duty is a gift made by the French Government to the exporter, and through him to the foreign consumer. The effect of this bounty certainly is to encourage exportation; but not necessarily to encourage production.

As regards Mr. Giffen's further position that the exportation caused by this bounty has the effect of raising the price to the French consumer, it is to be observed that this argument involves the assumption of a number of very uncertain conditions. It might be so, if the supply of sugar in France were a fixed quantity, if by means

To prevent misunderstanding, however, I may state briefly that Sir Thomas Farrer's account of my statements is so palpably erroneous as to require no refutation in detail. I can only refer those interested to the report itself.

I am, &c.,

July 6th.

R. GIFFEN.

SUGAR CULTIVATION IN INDIA.

Statistics in relation to sugar growing in India are proverbially unreliable. The following we take from *The Board of Trade Journal* for July, which takes its information from the *Allahabad Pioneer Mail* of 2nd June last.

We think our readers, after a careful perusal, will feel that they are not much wiser than they were before.

The statement is made that the area under sugar (cane) cultivation is 2,500,000 acres, and that it takes one acre to produce one ton of sugar—hence the production of sugar is 2,500,000 tons. Seeing that a large proportion of the product of the sugar cane is not made into sugar at all, but consumed in the juice state, this inference will not hold water. The statement is also made that it takes two-and-a-half tons of raw sugar to make one ton of refined :—

“A resolution has just been issued by the Revenue and Agricultural Department of the Government of India regarding the sugar cultivation in that country. The Government of India has for some years past been endeavouring to obtain accurate information on this subject. In 1882 the local governments and administrations were asked to collect statistics, but as the information returned was palpably incomplete, supplementary reports were called for. It is with the statistics so compiled and corrected that the resolution deals. Those statistics show that the area and out-turn of sugar plants may be estimated as follows: area in acres, 2,500,000; out-turn of coarse sugar per acre, 20 cwt. (1 ton); total out-turn in tons, 2,500,000. It must, however, be explained that sugar is not produced from the sugar cane alone. In India the date-palm, the palmyra-palm, and the cocoa-palm all yield sugar, and the areas under these trees may be roughly estimated as follows: date-palm, 168,262 acres; palmyra-palm, 14,100 acres; cocoa-palm, 2,930 acres.

“That, however, the statistics which have been collected are inaccurate and incomplete, the smallest attention to the subject will show; indeed, the Government of India itself admits this to be the

case. The great difficulty seems to lie in obtaining a correct return of the area under sugar-cane cultivation, and notably it would seem in Bengal. Perfect accuracy may be attained in these provinces, where we see such an elaborately minute set of revenue papers; but Bengal with its permanent settlement seems to obtain accurate statistics on this and other cognate points only with difficulty. Starting with the estimated area under sugar-cane, it is found that these provinces head the list with a per-centage of 2·9 as compared with total cultivation; then follow Oudh and the Punjab, each with 1·7 per cent., Assam with 1·1 per cent., Mysore with ·73 per cent., Bengal with ·53 per cent., the Central Provinces with ·35 per cent., Bombay with ·29 per cent., and Madras with ·18 per cent. The low per-centages in the case of Bengal, Bombay, and Madras seems to indicate, the Government would conclude, that the area under cultivation has been under-estimated. The area under sugar-cane in the Madras Presidency is set down at 44,000 acres, whereas the average area under sugar plant for the years 1883-84, 1884-85, and 1885-86, as given by the Madras Government, is as follows: sugar-cane, 62,000 acres; cocoa-nuts, dates, and palmyra, 29,800 acres.

“In regard to the Bombay Presidency, the area given would not seem to be so much understated as the Government of India holds, for if to that area be added the cane area of the Native States, and the average out-turn be worked out, and if to such result be added the net imports into the Presidency, the total would give 109 lakhs for consumption, or an average consumption of 19½ seers per head of population; this latter figure is certainly not low.

“Turning now to the average consumption per head of population, the subjoined figures are given :—

Madras, 8½ lbs.	North-West Provinces, 34 lbs.
Bombay, 39 lbs.	Oudh, 16 lbs.
Bengal, 9½ lbs.	

(It should be observed that the foregoing only relates to coarse or unrefined sugar, 2½ maunds of which are equivalent to 1 maund of refined.)

“In respect to the utter want of harmony shown by these figures it is explained that the mass of the agricultural population are not so well to do as their brethren in the North-West, and it is also pointed out that in Oudh sugar-cane occupies 1·5 acres per 100 acres as against 3 per 100 cultivated in the sister province.”

CULTIVATION OF SUGAR IN PERSIA.

In a country where there are no made roads, navigable rivers, or canals, and scarcely any seaports or shipping, and where there is but little security for property, it is not surprising that the sugar industry in Persia should not be in a flourishing state. The following we take from a recent number of the *Journal of the Society of Arts* :—

“The sugar cane was introduced into Persia from its original home in Bengal at a very remote period. The first indisputable mention, says the United States Consul at Teheran, of sugar by a western writer is that by Moses Chorenecrisis, in the fifth century, who describes the sugar-cane as he saw it growing on the banks of the Karún river, which joins the Shott-et-Arab at the head of the Persian Gulf. In the olden times, and as late as the fourteenth century, the sugar cane was much cultivated in Susiana, the country intersected by the Karún river, and principally near Ahwaz and Jundi Shapur. Susiana was then one of the principal intermediate commercial stations between the present towns of Dizful and Shushter, and had its water from the Karún river by means of canals cut from the right bank, some distance above Shushter, and from the Diz river by canals cut from the left bank, near the town of Dizful. With the decline of Jundi Shapur, in the thirteenth century, the canals were neglected, and the cultivation of sugar cane necessarily ceased. The present Ahwaz is a small village of about fifty houses on a mound, which covers the ruins of a part of the former town. Hundreds of mill-stones or wheels, formerly used for squeezing the juice out of the cane, are lying about in all directions. Persian historians do not ascribe the ruin of Ahwaz to the failure of the water supply, but to scorpions. They say that an Indian merchant, with the view of raising the price, bought up all the sugar he could, and stored it for a year or two; when he opened his stores all the sugar had turned into scorpions; millions of scorpions came out of the sugar store, all the inhabitants of Ahwaz fled, and the city has remained a desert from that day. There is still current in Persia a proverb which says, ‘At Ahwaz sugar cane produces scorpions,’ and one of the Persian poets, referring to the ringlets of his mistress, says, ‘They are as deadly as the scorpions of Ahwaz.’

“The only district in Persia where sugar cane is now cultivated is Mazanderan, which is the principal rice producing district.

and it was probably introduced during the last century. The sugar cane in Mazanderan requires twelve months to ripen, but the canes are so small and poor, few being ever found thicker than a man's finger, and the produce is of very inferior quality, being dark and moist. Both of these defects, in all probability, arose from want of skill in the cultivation and preparation of this valuable plant. The sugar cane is mostly consumed in the province; a considerable portion, however, is exported to Gilan, and some to Russia. The canes are planted in slips with two or three joints, in February or March, and ripen about eight or nine months after, having then a height of about five feet. One mill turns out per day about 200,000 pounds of juice, and about 60 to 70 pounds of sugar. The juice, therefore, yields 30 to 35 per cent. of sugar. Only raw sugar is manufactured in Mazanderan. There are no sugar refineries. The raw sugar is sold at the place of manufacture in the villages at from three-farthings to a penny a pound, and in the markets of Sari and Barfunish at from a penny to twopence a pound, according to the quality. In some towns of Persia, principally Yezd and Ispahan, Jaru raw sugar was, up to a few years ago, refined and made into loaf sugar. The loaf sugar made in Persia was seldom perfectly crystallised, and was on that account very soft; it was also more or less impure and dirty, the loaves not having been properly washed, and the green syrup not having been completely removed. The imported loaf sugar becoming very cheap, sugar refining in Persia ceased to be profitable. The general Persian word for sugar is shakar, the sugar cane is udi-i-shakar, while refined sugar is kand, a loaf of sugar is kelleh-i-kand, sugar-candy is nabat. Persia is famous for its sugar-candy. This is made in the ordinary way, but is left to crystallise on strings in a bowl of earthenware or china. The strings are kept at the bottom of the bowl by a piece of lead, and at the top by strips of wood; when taken out of the bowl it retains its shape, and is called kasch-i-nabat, *i.e.*, a bowl of candy. Consul Schindler is of opinion that sugar cane would thrive well in some districts of Persia and Southern Persia, at altitudes of from 1,000 to 3,000 feet above the level of the sea. The Plain of Bugh-i-Mailik, east of Shushter, at an elevation of 2,600 feet; that of Shapur, west of Shiraz, elevation 2,500 feet; those of Fihift and Rullbar, south of Kerman, elevation 2,500 feet, appear to him to be eminently suited to the cultivation of the sugar cane."

THE COLONIAL BANK.

HALF-YEARLY MEETING HELD 4TH JULY, 1889.

The 103rd half-yearly general meeting of the shareholders of the Colonial Bank, was held on 4th July, at the offices, Bishopgate Street, under the presidency of Mr. H. H. Dobree. The Balance Sheet showed that on December 31st last, there were total liabilities of £4,291,661, including deposits at interest and on current account £1,682,946, and bills payable and other liabilities £1,402,647. The principal assets were bills receivable, &c., £1,288,735, bills discounted in the colonies, bills in transit, and advances on security, &c., £1,316,939, and English and Colonial Government and other investments held in London £930,669. The gross profits for the half-year, after providing for bad and doubtful debts, had been £62,689, the net profit being £30,394.

In moving the adoption of the report the chairman stated that the deposits had increased by about £200,000, and on the other side of the Balance Sheet the investments and the cash in London and specie in the West Indies rather exceed that amount. The position of the bank was financially even stronger than it was in December. They had only just succeeded in earning 5 per cent. for the half-year to December 31st. The period under review, he thought he might say, had been more influenced by the very low prices prevailing for sugar than any previous half-year; but he hoped the corner had now been turned. They had opened an agency at St. Pierre, Martinique, and they were now endeavouring to obtain information as to the prospects of business in some other adjoining foreign islands. They expected the suit "*Williams v. the Colonial Bank*" to come on before the Long Vacation; but in this matter they were in the hands of the House of Lords.

Since the 31st of December, the date to which the accounts went, there had been a great rise in the price of sugar, which had placed in the pockets of the West India planters between £1,250,000 and £1,500,000. What they had most to congratulate all connected with the West Indies upon was that the rise had been entirely produced by natural causes, the increase in consumption being in excess of that of production. There was every probability of remunerative prices ruling for some considerable time, and the only danger which suggested itself to them at present was that the higher price might check

consumption. There was no doubt that the West Indies were able to produce sugar under more favourable circumstances and more economically than they could when the crisis set in about four years ago; and they were now less absolutely dependent on the production of sugar. The prospects for the British West Indies, and therefore for the bank, were more favourable than they had been for many years past. In reply to a question, he added that if they won the suit referred to, they would be £17,000 to the good, while if they lost it, provision having been made, they would be none the worse. Mr. James Fletcher seconded the motion, which was adopted, and a dividend of 5 per cent. for the half-year was afterwards approved.

COLONIAL "HONOURABLES."

In answer to Sir G. Baden-Powell, on the 9th July, as to whether there were any new regulations or instructions relating to the use of the prefix "honourable" in addressing members of Colonial Governments or Legislatures, Baron H. de Worms, the Under-Secretary of State for the Colonies, said:—

"There appears to be a misapprehension, the origin of which the Secretary of State has not been able to trace. The question has not been raised recently in any shape, and the Secretary of State has certainly issued no directions on the subject. The title of "honourable" has for many years been accorded to members of Executive Councils and Legislative Councils in all colonies, including the smaller Crown colonies. It has at no time been the practice to use that title in addressing colonial gentlemen residing in this country; but it is a common practice to accord it when the person entitled to it is absent from his own colony on a visit to another colony. The reason for not addressing colonial gentlemen by that title when they are in this country would appear to be that here it is not adopted as a designation of any Executive or Legislative *status*, being the courtesy title distinguishing sons of peers. But although no new instructions have been issued on this subject, it happens to be the case that during the Colonial Conference the Secretary of State did take the new course of addressing as "honourable" the colonial representatives actually serving on the conference, feeling that their presence here on official duty might properly be so recognised."

MR. C. T. RITCHIE, M.P., ON THE SUGAR CONVENTION.

Mr. Ritchie, at a banquet at Beaumont Hall, Mile End, London, on the 26th June, replied to the toast of "Her Majesty's Ministers;" and in the course of his speech, after referring to the failure of the Sugar Convention entered into by the Liberal Government of 1864, said: When the present Government came into power there was distinct evidence that some foreign Powers at least were getting heartily tired of the system, and there was reason to hope that if the bounty-giving Powers could be got together in conference, some mutual arrangement might be arrived at which would secure the abolition of the bounties. The Government took advantage of this frame of mind, and the result of the negotiations they entered into was that the Powers of the Continent met in conference, and in the end a Convention was signed by all the Powers with the exception of France, which, if carried into effect, would undoubtedly secure the object in view. In order, however, to obtain this result, it was necessary that the Government should agree to what had been called a penal clause in the Convention, because, although they assented to such a clause with reluctance, they saw clearly that without this penal clause it was quite impossible for any agreement to be come to—that unless there was some punishment entailed by the breach of an arrangement which had been arrived at, it would be quite impossible to feel secure that the arrangement would be carried out. For such a clause the Government had a precedent in the Convention of 1864, and the result of adopting the clause had been to secure the signature of the Convention. He had said that the Convention had been agreed to by all the Powers except France, and he was bound to say that here he considered there was an undoubted weakness in the Convention. But the delegates from France, although not signing the Convention, expressed themselves friendly to the object and the scope of the Convention and gave their assent to it in principle, and the Government hoped that France would ultimately join.

Mr. Ritchie then referred to some of the points that had been advanced by opponents of the Convention. There had recently been presented to Parliament a paper signed by Mr. Giffen, of the Board of Trade, giving a considerable amount of interesting information in connection with the sugar trade, which was well worthy of the study of those who were interested in the question. Sir Thomas Farrer, who had been one of the most violent of those who had attacked the action

of the Government, found in this paper some things which did not altogether fit in with his arguments, so he attempted to make a most astounding and outrageous charge against Mr. Giffen—namely, that he had been induced to put his name to certain statements of which he did not approve. He himself did not believe that Mr. Giffen was capable of anything of the kind, and for Sir Thomas Farrer to make so grossly unfair and unjust an accusation against so distinguished a public servant, only showed the lengths to which he was prepared to go in order to carry his point and damage the Convention. Sir Thomas Farrer attempted to make a great point as to a difference between the amount of the bounty given in this paper and the amount stated by Baron H. de Worms, but the point was not one of great importance. What was material in the matter was that a large bounty did undoubtedly exist, whether bounties were good or bad for the consumer. He contended that they were not good but bad for the consumer, and in this conclusion he was backed up by an expression of opinion on the point by Mr. Gladstone in 1881, when he was Chancellor of the Exchequer.

The right hon. gentleman then went on to show that our sugar trade was diminishing under the bounty system, and that bounty-fed sugar was taking the place of non-bounty-fed sugar in our markets. In 1884 there were 816,000 tons of sugar refined in the United Kingdom; in 1888, 739,000 tons, a decrease of nearly 10 per cent. in four years. There had also been a large decrease in the import of cane sugar. In 1878 the import of cane sugar from British possessions was 278,000 tons; in 1888 it was 172,000, a decrease of 40 per cent.; and during the last five years there had also been a decrease of 75,000 tons from foreign countries. In face of those facts could there be any question that the operation of the bounty system imperilled the ultimate position of the consumer? It had been said that the recent high price of sugar had been the result of the Convention. But the absurdity of supposing that a convention which was not to come into operation for two years had raised the present price of sugar hardly required to be demonstrated. If it did the fact of sugar being £10 a ton cheaper for delivery next January than for present delivery sufficiently demonstrated the absurdity of the convention. The recent high prices had not been the result of the Convention, but of the bounty, which had checked the production and importation of sugar grown under natural conditions. Mr. Ritchie next contended

that there was no foundation for the objection that the Convention would shut out large quantities of beet sugar, and urged that the suppression of bounties would give an enormous impetus to the growth of cane sugar—more than sufficient to meet any possible withdrawal through the adoption of the Convention—especially in our colonies, to which, he argued, the system of bounties against which the Government were contending was grossly unfair. There never was a time, he believed, when the importance to us of our colonies was more fully recognised than at present, and should it go forth to them that now that the way seemed open to the abolition of this gross injustice we refused to take advantage of it because of the absurd and ridiculous croakings of a school of political economists who were prepared to see the British Empire imperilled rather than that their pet theories should be disturbed? The proposals of the Government were not protective but free-trade proposals. Bounties were protection in its worst form. The object of the Convention was to destroy those bounties, to destroy the protection, and to open up our markets to the natural supplies of the whole world.

BARBADOS.

CO-OPERATION *versus* ABSENTEEISM.

In the *Barbados Agricultural Gazette and Planters' Journal* for June is an article on this subject, which we have pleasure in reproducing:—

“Several of our estates have recently passed out of the Court of Chancery. Our local Sugar Estates Company fortunately secured one of these. Others have passed into the hands of private individuals (some of whom are absentees). Under the stimulus of the late rise in the price of sugar we doubt not that all those estates which have been appraised at anything like a reasonable figure will be sold out of the Court early next year. Our object then in this article is to urge our local capitalists to have courage and faith in the future of this island and of its staple product, and not to allow any more of our best estates one by one to be bought up by absentees.

“The expediency of allowing land to be held as an absolute possession is being questioned by speculative thinkers, and will be more and more questioned, as those whose lot it is to labour realise the power over their labour which this possession confers. Property has its duties as well as its rights, and those whose labour gives its value to land will, we opine, always be ready to acquiesce in this

system of land tenure so long as some attempt is made by the owners of land to fulfil these duties—so long as it is seen that the propertied class are making some effort to use their abilities and opportunities for the good of the community. But in this island it will not be so readily acquiesced in, when it is fully and generally realised that, year by year, a very large proportion of the profits arising from a great many of our best estates is steadily flowing into the pockets of persons who make no effort to render service for the privilege conferred. Again and again we hear in private circles discussions as to how best we might reach the absentee proprietor, and make him recognise that something more is expected of him than is received.

“We are for the gentlest methods; and we would rather strive to prevent the increase of absenteeism than allow it to grow to a quite unbearable evil only to be got rid of by a social convulsion. For this reason we rejoice when we see our estates fall into the hands of local capitalists rather than into the clutches of an absentee. For this reason amongst others we have for years urged on the people of this island the advantages to be derived from co-operation. It was for this reason that we threw out in these columns the idea of Sugar Estates Companies that has recently been so effectually cast into practical shape—and for this reason we would continue to urge on all those who have this island’s welfare at heart that they should each add their contribution towards the steadily growing corporate strength of a Company that opens the way for a profitable investment of his savings to every struggling man among us who desires to better his position. If we consider for a moment the huge sum that yearly flows hence into the pockets of absentee proprietors—the clearances of such large and fine estates, as the *Belle, Lower Estate, Lears, Kendal, Drax Hall, Sunbury* and *Hampton, Colleton, Mt. Wilton*, and others too numerous to mention—and if we reflect for a moment, what would in a few years be the result if this wealth flowed rather into the pockets of the people of this island whose toil produces it, we shall realise the inequality of this system of absenteeism.

“For Heaven’s sake let us put shoulder to shoulder to check the growth of the evil. Do not let us stand by with folded arms and see our estates slip out of our possession. It has been well said that opportunity is a saddled horse that gallops past us. If we will but seize the bridle and vault into the saddle it will carry us to fortune. If we lack the energy and the courage, it will speed on till it meets some braver one, and we shall be left behind.”

EUROPEAN BOUNTIES ON SHIPPING.

A Return has recently been made to the House of Commons of the various European countries giving bounties or subsidies for the construction or running of ships, from which it would appear that

ITALY

gives a bounty of 48s. per ton gross measurement on the construction of vessels built of iron and steel, and 12s. per ton on those built of wood. The bounty on the construction of "floating material" (Galleggiante) of iron or steel is fixed at 24s. per ton. No bounty is given for the construction of vessels in which the framework is wholly of iron or steel and the outer covering of wood. Any increase in the length of vessels shall be considered as repairs. The bounty on engines is 8s. per indicated horse power, and on boilers 4s. 10d. per quintal (212 lbs.) in weight.

The addition of from 10 to 20 per cent. in the bounty is made in favour of vessels adapted for military purposes and fulfilling stipulated conditions. No expenditure has as yet been incurred under this head. There is a bounty granted to owners of vessels bringing coal of 9½d. per ton.

The Act from which the foregoing summary is taken is dated 6th December, 1885, and to remain in force for 10 years. An addition to the bounties established by this Act was made 22nd March, 1888. No pleasure vessels, nor vessels belonging to lines already in receipt of subsidies shall be entitled to claim the bounty.

The bounty given in respect of coal was in 1886, £5,527; 1887, £6,931.

FRANCE.

The bounties given on French shipping are payable under an Act of 29th January, 1881. There is no limit in respect to time on the bounty for construction, but the bounty on running expires in January, 1891. For the six years 1881-5 the bounty for construction amounted to £690,860, or about £115,000 a year. As will be seen by the yearly statement the amounts vary considerably—

1881	£38,032	1884	£179,396
1882	181,620	1885	45,164
1883	126,408	1886	120,224

The amount of bounties for running ships of all kinds is as follows:—

1884 ..	£343,573		1885 ..	£302,691		1886 ..	£303,134
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AUSTRIA-HUNGARY.

No bounties on shipping are granted, but such material as are required for the construction of ships pay no import duty.

GERMANY.

No bounties are granted directed to shipping interests.

RUSSIA.

No *direct* is given by the Government for the construction of ships, but several of the works engaged in shipbuilding have at different times received considerable *indirect* assistance in the form of loans from the Government.

SWEDEN AND NORWAY.

Neither bounties nor subsidies for the construction of ships are granted.

TURKEY

has never given any money bounties or subsidies for the construction and running of ships; but timber destined for the construction of vessels bearing the Turkish flag is allowed to be filled on state forests free of charge, and such vessels for the first two years are exempted from Harbour dues on Ottoman ports.

SPAIN.

By the law of 25th June, 1880, a bounty will be given to Spanish Ship-builders of 40 pasetas (32/-) per ton measurement on the total tonnage of vessels built in Spain in accordance with established regulations.

The tariff duties paid on materials used in their construction and fitting out, will be returned to the constructors.

BELGIUM

does not grant subsidies, premiums, or assistance on the construction or navigation of merchant vessels, except so far that certain materials specified, used in their construction are admitted free, or, if the duty has been paid, it is remitted.

PORTUGAL.

No ocean-going steamers are built in Portugal.

GREECE.

No bounty for construction or equipment of vessels is given to companies or individuals.

DENMARK.

This country gives neither bounty nor subvention to shipment—and the same as regards Roumania and Bulgaria.

It will be seen from the foregoing somewhat general statement that the bounties granted on foreign shipping are not a very serious affair, and not sufficient to enable those countries giving them to compete successfully with British shipbuilders in other markets.

THE STRAWSONIZER.

The new agricultural appliance known as the Strawsonizer was recently subjected to a series of trials at the Flemish Farm, Windsor Castle, in the presence of a numerous company who had assembled in compliance with an invitation issued by Mr. Jacob Wilson and his co-directors. Many important trials, especially in steam cultivation, were carried out at the Royal Farms, under the auspices of the Prince Consort, and special interest attached to the trials, inasmuch as it was the first time the Royal farms had been used for such a purpose since the days when his Royal Highness took so great and active an interest in the progress of agriculture. The Strawsonizer is a machine of light construction, resting upon two wheels, and easily drawn by one horse. By means of a multiplying gearing the revolutions of the driving wheels are communicated to a fan, which is caused to perform from 3,000 to 4,000 revolutions per minute. The fan is axled within a tube from the hinder end of which there issues a powerful blast of air, and this, catching the stream of solid or liquid material which is discharged from a hopper above, scatters such material in a fashion which has never previously been approached. By a few simple alterations and adjustments the same machine can be used for the distribution of liquids or of solids. To save time, however, two machines were kept running. The first distribution shown was that of paraffin, such as is consumed in oil lamps, and favourably known as a powerful insecticide, very destructive of turnip fly and other crop pests. The nozzles first employed were those for effecting distribution upon the ground, and at 50 or 100 yards distance the petroleum spray could be seen as a delicate mist following the machine in a band quite 20 feet wide. Blades of grass and other leaves picked from the ground were found to be coated by a delicate film of paraffin, the odour of which would be quite

sufficient to disgust and repel any insect pest. Next, the nozzles were adjusted for distribution laterally and upwards, as between the rows in a hopyard or vineyard, and the results were remarkably satisfactory.

To illustrate the capacity of the machine as a broadcast sower of grass and clover seeds, and of grain of all kinds, some barley was put in the hopper and fell upon the ground with striking regularity and uniformity. As a rapid and uniform distributor of artificial fertilisers—such as nitrate of soda, sulphate of ammonia, kainit, superphosphate of lime, and basic slag—the machine is equally effective, its capabilities in this respect being well illustrated by passing through the distributor a quantity of common salt. But what most impressed the spectators was the way in which the machine dealt with finely-powdered quicklime. As this material issued from the distributing tube, it was difficult to believe that it was a cloud of lime, and not of steam, that filled the air, and was wafted by the gentle breeze across the surface of the field, upon which the particles gradually subsided and formed a continuous film. A young crop of any kind attacked by insect or slug would be saved from destruction by a dressing of quicklime thus applied in the early morning with the dew still on the ground, and as many as 8, 10, or even 12 acres per hour could thus be treated. The machine can be adjusted for greater or less delivery as may be deemed desirable, and as small a quantity as one gallon of paraffin or 28lb. of nitrate of soda can be uniformly spread over an acre. The Strawsonizer for special use in vineyards and hopyards is made narrower than the agricultural machine, to facilitate its passage between the rows, whilst hand machines are made for use in greenhouses and gardens. Originally designed to save crops from the ravages of insect and fungal pests, the Strawsonizer is now proved to be one of the most useful and efficient general machines of the farm, besides which it will be very largely employed as a distributor of deodorisers and disinfectants in large towns, markets, and showyards. As a sanitary apparatus it is likely to be very extensively used in the towns of India.

The trials throughout were of a most satisfactory character, and the visitors, amongst whom were Sir John Heron-Maxwell and Mr. James Hornsby, went away thoroughly impressed with the intrinsic value and economic importance of so ingenious an invention.

NOTES ON BOOKS.

THE (Periodical Press) INDEX. A monthly record of leading subjects in current literature. Annual subscription, post free, 13/-; or 21/- if with supplementary yearly digest. Single numbers, 1/6. Published by Messrs. Trübner & Co., London.

Time is money; and the object of this useful publication is to save time. There are many articles and contributions appearing every month in the newspapers and magazines of great value and interest, which we might wish to read, if we only knew of them.

The aim of this monthly "Index" is to present a record of the more important subjects dealt with in periodical literature, at home and abroad. The publication is divided into two parts. PART I. consists of subjects, ranged in classes from A to K, and in each class are several divisions. For instance, Class H is headed "Science and Scientific invention," and this is subdivided as follows—I. General Science; II. Mathematics; III. Physics (Natural Philosophy) including Invention; IV. Chemistry and Chemical Appliances; V. Astronomy; VI. Physiography; and Meteorology; VII. Geology and Palæontology; VIII. Botany; IX. Natural History; X. Medicine.

PART II. is arranged according to principal key words, with full reference to subject Index. Take for instance Hydrogen, compressibility of—it tells us to refer to April 18,—283 *Nature*, that is to say in the number of *Nature* for April 18, and at page 383 we shall find the article or paper in question.

The same is given under the subject head Class H, in division IV., Chemistry and Chemical Appliances, and from this we see that the author is H. Crompton.

At a first sight, and to the general readers "Index" may appear a little puzzling, but on reference to the explanations given, and half an hour's study of its plan and method, its value and usefulness becomes very apparent.

We wish success to "Index" and that it may be commensurate with the time, trouble, pains, and labour which such a work entails.

DE SUIKERGWESTIE, toegelicht uit hare geschiedenis. De Suikerpremiën, hare oorzak en werking. De Suikerconferentiën (1863-1889). (The Sugar Question, illustrated by its history. The Sugar Bounties,

their origin and operation. The Sugar Conferences, from 1863 to 1889.) Cremer & Co., The Hague.

We have received from the author, Herr A. G. A. Elias Schovel, a brochure of some 240 pages, with the above title. After giving a history of the rise and progress of the beetroot sugar industry, an account of the different modes of levying sugar taxation and the premiums arising out of them, and a resumé of the proceedings of the various Conferences which have been held on the sugar question, notably the one now in progress, he comes to the conclusion that as far as Holland is concerned, it must be left to statesmen and those in authority to decide whether a treaty should be entered into, as the sugar question is a Gordian knot, so complicated, that not even the famous Alexander could cut it at one blow. The author hopes that the attempt to put an end to premiums may succeed, but declines to answer the question whether Holland should abolish the tax on sugar, while giving the main factors necessary to be considered, and evidently thinks that science will enable the manufacturers, sooner or later, to evade to some extent whatever fiscal regulations may be put in force. The book is a good resumé of general historical facts, and unusually free from puzzling statistics, but is written from a point of view too exclusively national, and hence is scarcely adapted to interest any but specialists, who may happen to be acquainted with the Dutch language.

“PERUVIAN GUANO.” (A Retrospect.) By Hermann Voss. Published for the Anglo-Continental (late Ohlendorff's) Guano Works. London Agency, 15, Leadenhall Street, E.C. 1889.

The occurrence this year of the jubilee of the introduction into Europe of Guano, naturally leads one to seek for some information as to the history of an industry which has within a few years raised itself to a position of such importance—as shown by the fact that some 6,000,000 tons of guano have been used in this country, or on an average of more than 120,000 tons yearly.

To meet this want Mr. Voss has written this useful pamphlet on Peruvian Guano, in which he gives its origin; its discovery; the various Guano contracts; the quantities shipped and sold; its composition and analysis; its adulteration; and some account of prepared or OHLENDORFF'S Dissolved Peruvian Guano.

In the regions where the Guano deposits are situated (between the

7th and 20th degree, south latitude) rain falls on very rare occasions, which is the reason why the Guano is so well preserved, in spite of its age of probably a thousand years.

The following description of its formation, by one who passed a considerable time at the Chinchas Islands and along the coast of Peru, will be found interesting:—

“The deposits of Lobos de Afuera having remained unworked for some years previous to the middle of 1879, and the birds having become reassured, they returned to their old haunts. I paid my first visit to these islands during March of the year just mentioned. The pelicans were then assembled together at a deposit already partially formed, and on the surface of it they were hatching and rearing their young. The nests, consisting of a circle of dry seaweed and odds and ends, appeared to have been constructed more with the view of indicating the limit of each pelican's property, or of preventing the eggs from rolling down into the sea, than of forming comfortable receptacles for newly-hatched chicks. They were situated side by side close to each other; so much so, indeed, that when any one of the parent birds moved from its sitting posture, it was sure to incommode one or other of its neighbours. Most of the eggs were hatched, and the great concern of the pelican mothers and fathers, morn and noon, was to provide their offspring with the necessary nourishment—fish, of course. At first, the little ones were too weak to get out of what appeared charmed circles, and there they remained eating and depositing the live-long day.

“As they gained strength, however, they began to move about, but limited their peregrinations to the deposit on which they had been hatched, unconsciously facilitating, in this manner, the work of the loading companies. The young birds, if approached while gorging (for this expression is much more applicable than eating), throw up what their enormous beaks momentarily contain. One young bird, which could not fly, vomited up in my presence five large herrings! I had the curiosity on one occasion to put one of the more fully-developed birds, which could not fly, on to the scales. It weighed over 19lbs. I left the islands in April, 1879, and returning in June of the same year, I still found young birds parading about, and conclude from this that the breeding season extends over some two months.”

Although the introduction of Guano into this country is of comparatively recent date, its use as a fertilizer dates back, says Mr. Voss, some hundreds of years; and the natives of Peru held the preservation of Guano and of the bird who produces the same of so much importance, that severe measures were taken with those who disturbed the birds during the breeding season.

The first shipment to this country was to Liverpool in 1839, of two tons, followed by a cargo in 1840. The first contract with London, made by the Peruvian Government, in 1841, was with Messrs. Anty, Gibbs & Co., which was renewed from time to time, extending over twenty years, and during this period the quantity shipped to Europe is estimated at 5,000,000 tons. Under the head of

“AGRICULTURAL RESULTS OBTAINED WITH GUANO”

Mr. Voss says:—

“Soon after 1840, when Liebig advocated the treatment of bones with acid, the question of manures, other than farm-yard dung, seriously occupied the mind of farmers, and the first few volumes of the *Journal of the Royal Agricultural Society* are witness to the many trials made, and the satisfactory results obtained by the use of dissolved bones.

“But much more important were the results obtained with guano, which put all other manures in the shade.

“Dr. Andrew Ure, in his report on Guano, in 1843, thus comments on the advent of guano in this country:—

“‘The extraordinary excrementitious deposit of certain sea-fowls, which occurs in immense quantities upon some parts of the coast of Peru, Bolivia, and Africa, has lately become an object of great commercial enterprise and of intense interest to our agricultural world. Four or five years ago it was exhibited and talked of merely as a natural curiosity. No one could then have imagined that in a short period it would be imported from the coasts of the Pacific in such abundance, and at such a moderate price, as to cheer by its fertilizing powers the languid and depressed spirits of the farmers throughout the United Kingdom. Such, however, is now the result, as attested by the concurring reports of almost all the agricultural societies of Great Britain and Ireland.’

“Baron Liebig considered that the importation of 1 cwt. of guano was equivalent to the importation of 8 cwt. of wheat; so that 1 cwt. of guano, with due culture, assumes the form of 8 cwt. of substantial food for man.

“Now we have used in this country, during the last fifty years, about 6,000,000 tons of guano, which, according to Liebig’s theory would be equivalent to 48,000,000 tons of wheat, so that the additional crops raised by the aid of this wonderful fertilizer must have been enormous, and the pecuniary advantage to our agriculture must have been very great.

“When first introduced, guano contained as much nitrogen as one ton of nitrate of soda, and as much phosphoric acid as one ton of superphosphate, whilst the cost of one ton of nitrate and one ton of superphosphate

was about double the value of one ton of guano. It is therefore, clear why the British farmers very largely invested in this cheap and efficacious manure.

“We have the following note about the former prices of guano :—

“At the outset of the regular guano trade, the prices ranged between £10 and £15 per ton ; during 1846-48 it remained at £9—its lowest point ; during 1849-53 it advanced but slightly to £9 5s., reaching £10 in 1854, £11 in 1855, £12 in 1856, and £13 in 1857. In 1862 it was £12, and remained since between £12 and £13, until the price was regulated according to a certain scale, according to quality, when prices became variable.’

“Various papers and reports published in the Journal of the Royal Agricultural Society during the last fifty years, give numerous trials with guano, all of which show high results. It would be useless to repeat them here, for every farmer knows that if guano is only of good quality, satisfactory results are sure to follow, and he has full confidence in same.

“Unfortunately, this confidence has been often taken advantage of to place inferior manures under the disguise of guano.”

Under the head of

“ADULTERATION OF GUANO”

a number of extracts from different writers on the subject are given, cautioning purchasers against counterfeits :—

“Since the name of Guano, as originally adopted for the Peruvian deposits, is so much abused and used for all sorts of fertilizers, it is necessary to insist upon the description of *Peruvian Guano*, as the name of Guano alone would not give sufficient security nor guarantee the genuine article.”

Dr. Voelcker in one of his reports, some years ago, says :—

“Damaged Peruvian Guano is eagerly bought up by dealers in artificial manures at its full market value, and afterwards frequently mixed with some kind or other of phosphatic material, and again sold at a good profit under an assumed name, such as Coral Island Guano, Phosphatic Guano, South Sea Guano, British Guano, &c.

“Adulterated Peruvian Guano, artificial mixtures, resembling in appearance Guano, were brought under my notice last season, professing to be peculiar kinds of Phosphatic Guano. Such mixtures generally contain a little real Guano, and the bulk consists of earthy matter of little or no fertilizing value. These manures do not profess to be Peruvian Guano, but to come from some island or other, the existence of which often occurs only on paper ; and as these Guanos are always sold at a low figure, they find

purchasers, although no guarantee as regards composition is given. In all cases in which Guano is sold without an analysis, the purchaser runs the risk of being imposed upon."

The last chapter is devoted to Prepared or OHLENDORFF'S Dissolved Peruvian Guano—but this we need not further allude to, as in the *Sugar Cane* for 1888, page 35, we gave some extracts from a pamphlet on the subject, showing its advantages in the cultivation of the sugar cane.

In 1883 Messrs. Ohlendorff's extensive factories in London, Hamburg, Antwerp, and Emmerich-on-Rhine were transferred to the Anglo-Continental Guano Works, which company now continues the Guano and Manure business.

At the end of the pamphlet is inserted Mr. John C. Morton's description of the London Factory, which we gave in the *Sugar Cane* for April last, page 213.

NEW SUGAR FACTORIES IN BRAZIL.

(From the *Pragerzuckermarkt*.)

The Austrian Consul-General at Rio reports that the Brazilian Government intends to erect three large factories, which will be provided with the newest apparatus for the diffusion process, and thus to introduce a radical reform into the national sugar industry. With the view of obtaining an accurate knowledge of the best methods of carrying out the diffusion process, they have sent a special commissioner to Gaudeloupe, who is to make a detailed report of the experiments, which are to be made there in April, with regard to the application of the diffusion process to cane sugar manufacture. On the basis of the information thus obtained the Brazilian Minister of Education will draw up a general plan for all the sugar factories the interest of which is guaranteed. The adoption of the diffusion process seems settled beyond a doubt. The Consul suggests that the Bohemian machinery manufacturers would be able to compete successfully with the Coil and Fives Lille establishments, which have hitherto monopolised this class of business in Brazil.

BARBADOS.

SUGAR MADE IN THIS ISLAND IN 1643.

Ligon, in his quaint and very interesting history of Barbados, first published in 1657, says at page 85:—

“At the time we landed, which was in September, 1647, we
“were informed, partly by those planters we found there, and
“partly by our own observations, that the great work of sugar-
“making was but newly practised by the inhabitants there.
“Some of the most industrious men having gotten plants from
“Fernanbrock (Pernambuco) a place in Brazil, and made trial of them
“at the Barbadoes, and finding them to grow, they planted more and
“more, as they grew and multiplied on the place, till they had such
“a considerable number as they were worth the while to set up a
“very small Ingenio, and so make trial what sugar could be made on
“that soil. But the secrets of the work being not well understood,
“the sugars they made were very inconsiderable, and little worth,
“for two or three years. But they finding their errors by their daily
“practice, began a little to mend; and by new directions from Brazil,
“sometimes by strangers, and now and then by their own people who
“were content sometimes to make a voyage thither, to improve their
“knowledge in a thing they so much desired. Being now much
“better able to make their queries of the secrets of that mystery, by
“how much their often-failings had put them to often-stops and
“nonplusses in the work. And so returned with more plants, and
“better knowledge, they went on upon fresh hopes, but still short
“of what they should be more skilful in; for at our first arrival, we
“found them ignorant in three main points that much conduced to
“the work, viz.: the manner of planting; the time of gathering;
“and the right placing of their coppers in their furnaces; as also the
“true way of covering their rollers with plates or bars of iron. At
“the time of our arrival there we found many sugar works set up
“and at work; but yet the sugars they made were but bare
“muscovadoes, and few of them merchantable commodities; so
“moist, and full of molasses, and so ill cured, as they were hardly
“worth bringing over to England. But about the time I left the
“Island, which was in 1650, they were much bettered; for then
“they had skill to know when the canes were ripe, which was not
“until they were fifteen months old; and before they gathered them

“at twelve, which was a main disadvantage to the making of good sugar; for the liquor wanting of the sweetness it ought to have, caused the sugars to be lean and unfit to keep. Besides they had grown greater proficient, both in boyling and curing them, and had learned the knowledge of making them white, such as now called lump sugar in England; but not so excellent as those made in Brazil; nor is there any likelihood they can ever make such; the land there being better, and lying on a continent must needs have constanter and steadier weather, and the air much drier and purer than it can be in so small an island as that of Barbadoes.”

MONTHLY LIST OF PATENTS.

Communicated by Mr. W. P. THOMPSON, C.E., F.C.S., M.I.M.E.,
Patent Agent, 6, Lord Street, Liverpool; 6, Bank Street,
Manchester; and 323, High Holborn, London.

ENGLISH.

APPLICATIONS.

8052. C. STEFFEN, London. *Apparatus for refining loaf sugar in the moulds.* (Complete specification.) 14th May, 1889.

8596. J. G. CHAPMAN, London. *Improvements in and connected with apparatus for evaporating and concentrating saccharine or other solutions.* 23rd May, 1889.

8622. C. STEFFEN, London. *An improved apparatus for producing white sugar.* (Complete specification.) 24th May, 1889.

9021. J. FOSTER, Glasgow. *Improvements in and relating to the drawing off and condensing of the vapour from sugar pans, and apparatus therefor.* 30th May, 1889.

9218. R. LOW, Glasgow. *Improvements in and relating to pans for boiling sugar and fruit for confections and preserves, and in brewers' tuns.* 4th June, 1889.

9903. H. T. GREEN, Birmingham. *Improvements in means for evaporating saline and other saccharine solutions, and other liquids and semi-liquid substances.* 17th June, 1889.

9994. E. MAIGROT and J. SABATES, London. *Improvements in apparatus for the manufacture of sugar by electricity.* (Complete specification.) 18th June, 1889.

10096. F. G. HARVEY, London. *Improvements relating to the evaporation or concentration of sugar and other liquids, and to apparatus therefor.* 29th June, 1889.

10975. C. W. GUY, Anerley. *Improvements in sugar cane crushing mills.* 8th July, 1889.

11136. S. PIRT, London. (Communicated by L. W. Tracy, United States.) *Improvements in evaporators or apparatus for the treatment of cane juice.* 10th July, 1889.

ABRIDGMENTS.

9183. GEORGE FLETCHER, of Masson Works, Litchurch, Derbyshire, Engineer. *Improvements in apparatus for use in boiling and evaporating sugar and other liquids.* June 23rd, 1888. Two series of steam U tubes are arranged with their ends fixed into a double chambered box or trunk, which passes across the bottom of pan. The box is supported on hollow trunnions in such manner that the tubes may be placed in either a vertical or horizontal position. A thin flat bottom is added to the pan to allow of a very shallow layer of syrup being treated. A convex and stronger bottom is placed outside the thin flat one, and serves to resist the atmospheric pressure. A pipe to equalize the pressure in the space between the true bottoms passes to the upper portion of the apparatus. The loose lid of the pan simply rests with its lower edge in an annular trough around the outside of the pan. This trough contains a sufficient quantity of mercury to fill up the interstices between the inside of the lid and the outside of the pan, whatever amount of vacuum be reached in the pan. The latter portion of the invention is applicable to existing apparatus.

76. OTHMAR LENZ, of 8, Genthinerstrasse, Berlin, Chemist. *Process for manufacturing colourless maltose syrup.* January 2nd, 1889. This process for producing white maltose syrup consists in extracting the same from starch dissolved in water at a high pressure, by means of a mash of malt heated to 50° Cent., then in removing partially the vegetable albumen by heating the solution to 70°, then in filtering the solution, and finally, in definitely separating the albumen by boiling the solution of maltose.

18383. W. R. WATSON and R. A. ROBERTSON, both of 45, Scotland Street, Glasgow, N.B. *Improvements in apparatus for evaporating, concentrating, and distilling liquids.* December 17th, 1888. This invention consists in partially filling up the pipes used in evaporating, &c., by means of a core of wood or other material, thus leaving an annular passage. The passages in the various pipes may gradually decrease in area to correspond with the reduced bulk of the liquid

under treatment. The cores are either plain or of varying cross section, which latter form assists to break up and retard the flow of liquor.

9320. ALBERT HENRI JACQUES BERGÉ, of 122, Rue de la Porte, Schaerbeck, Brussels, Belgium. *Improvements in the acid saccharification of amylaceous substances.* June 26th, 1888. This process consists in the saccharification of starch or starch bearing substances in a suitable autoclave or vessel, with a solution of sulphurous acid or hyposulphite of lime, after filling the autoclave with carbonic acid for the purpose of excluding the air, and subsequently heating the same to about 110° to 145° , while the pressure in the autoclave is raised by injecting gas. Various details in the application of this process to the treatment of starch, meal, of cereals or of potatoes, are respectively described.

11485. W. R. WATSON and R. A. ROBERTSON, both of 45, Scotland Street, Glasgow. *Improvements in apparatus for evaporating, concentrating, and distilling liquids.* August 9th, 1888. *Improvements on Taryan's patents, Nos. 14162, 1886, and 213, 1888.* The chief object is to simplify the construction of the apparatus. The circulating pipes return upon themselves in such a manner that the liquid is admitted and withdrawn at the same end of the apparatus. The pipes are thus free at the bent end, and so may expand or contract without danger of straining.

5559. HUGO BERGNER, of Bergen, of Germany. *Improvements in centrifugal separating machines.* April 1st. Chiefly details of construction. The material is fed from the bottom upwards by means of a pipe having a bell-shaped cover. A fluid pressure motion such as a turbine may be employed to drive the machine.

12357. R. A. WATSON, of Messrs. Mirrlees, Watson & Co., of 45, Scotland Street, Glasgow, N.B. *Improvements in centrifugal apparatus, the same being applicable for filtration.* August 28th, 1888. A number of annular plates are superimposed at suitable distances apart, around a central spindle, sufficient space being left to allow of a central feed. The "masse-cuite" or other substance under treatment, lodges between the plates, and the liquor displaced by centrifugal action escapes at the periphery, the residue being collected in the form of cakes or slabs.

16793. J. LAIDLAW, of Messrs. Watson, Laidlaw & Co., 98, Dundas Street, Kingston, Glasgow, N.B. *Improvements in the con-*

struction of Weston's centrifugal machines. November 19th, 1888. The upper feed opening of the basket is provided with an internal lip of a curved form, and this curve is struck from the centre of oscillation. By this arrangement the edge of the opening in the basket is always in close proximity to that in the outer casing, whatever be the position of the cage.

16794. J. LAIDLAW, of Messrs. Watson, Laidlaw & Co., 98, Dundas Street, Kingston, Glasgow, N.B. *Improvement in the construction of Weston's centrifugal machines.* November 19th, 1888. The discharge valve, when in its place at the bottom of the cage, is partly supported by an enlarged boss on the spindle. When it is wished to raise the valve out of the case, it may readily be tipped to one side to pass the feed hopper, &c., by reason of the small diameter of the spindle compared with the hole in the top of the valve.

17105. JOHN LAIDLAW, of Messrs. Watson, Laidlaw & Co., 98, Dundas Street, Kingston, Glasgow, N.B. *New or improved gearing for driving centrifugal machines.* November 24th, 1888. This is a device for obtaining very high speed (say 7,000 revolutions per minute), for the moving portion of a centrifugal machine, with a small speed (say 40 per minute of the handle. A bevel wheel fixed on the handle shaft imparts motion to a bevel pinion on a sleeve surrounding the vertical spindle of the machine. This sleeve carries two radial arms, each of which bears a vertical spindle near its extremity, and each of these spindles carries a spur pinion gearing with a circular rack, and a spur wheel gearing with the main spindle on a pinion carried thereby, the pinion and wheel being revolved together by reason of travelling over the circular rack. Instead of a handle, power pullies may be used, and in this case the gearing may be simplified.

7131. H. A. HUGHES, of Rio Grande, New Jersey, U.S.A. *Process and apparatus for obtaining sugar liquor from sugar cane, or for obtaining extracts.* April 29th, 1889. The heads or broom are separated by reason of the cane passing from a travelling apron to the slicing machine, the heads being too short to bridge over the space, drop therein, when their attachments are cut by the revolving slicing knives. The stalks are of course fed butt end foremost. The slices of cane descend over a series of inclined trays, and are subject to air currents to sort out leaves, &c., afterwards being shredded. This preliminary treatment is preferred, though other may be used. *For diffusion.* A central shaft carries radial arms

(ten in number for instance), to which the cane baskets are attached. These may be raised or lowered into or out of a circular series of diffusion cells. heated by steam or water in an outer jacket. The different lots of cane are treated in every cell in succession. Various details of construction are described.

8052. C. STEFFEN, of 40, Hengasse, Vienna, Austro-Hungarian Empire. May 14th, 1889. *Apparatus for refining loaf sugar in the moulds.* General moulds containing the sugar to be treated are super posed. The refining liquor or "cleare" (a solution of pure) sugar is caused to flow down through the series. The top mould, when its contents are quite refined, is removed, and another one containing a fresh lot to be treated is placed at the bottom. Thus the most refined sugar is always at the top, and receives the pure lixiviating liquor, while that last added is at the bottom.

AMERICAN.

ABRIDGEMENTS.

403788. C. STEFFEN, of Vienna, Austria-Hungary. *Lixiviating battery for raw sugar.* May 21st, 1889. This battery consists of a central cellular vessel for containing the graded lixiviating material, a series of lixiviating vessels for containing the sugar to be treated, and an interposed distributor having independent connection with each cell of the charging vessel and in connection with each lixiviating vessel of the series, whereby the contents of each cell are distributed and applied equally to the sugar in each lixiviating vessel.

405472. W. GOLDING, of New Orleans, Louisiana, U.S.A. *Diffusion battery.* June 18th, 1889. The cylindrical cells of the battery are provided with pistons which are actuated so as to compress the contents, and so prevent the waste usually caused by a quantity of liquor remaining in the treated mass.

405610. A. SEYFERTH, of Auerbach, Hesse, Germany, assignor to Louis Engelhorn, of New York. *Process of cleansing raw sugar.* June 18th, 1889. The raw sugar has usually been crystallised or formed into a wall upon the basket of a centrifugal, and there treated with steam jets or water. This invention consists of using some substance for treating the sugar wall which will drive out the dirt and impurities and which will not dissolve the sugar. Paraffin oil is mentioned as suitable, and is separated afterwards by dissolving the mass, and decanting or otherwise removing it from the surface.

GERMAN.

ABRIDGEMENTS.

45999. S. AMBROZEWICZ & J. DOBROWOLSKI, Ustie Sugar Manufactory, Post Berschada, Podolien, Russia. *Improvements in diffusion batteries with rotary diffusion chambers for crushed beetroot.* 25th February, 1888. The diffusion chambers are placed horizontally, and consist each of two cylinders one within the other. The inner one which receives the beetroot pulp is made of perforated tin, and provided with a pipe passing through the centre through which the water or desaccharating juice enters. The said liquid entering through this pipe passes radially through the beetroot pulp, and flows off through taps in the diffusion chamber. The desaccharated matter falls into a channel placed underneath the said chambers, and passes along this into a conical drum open at either end and perforated on the periphery. This drum revolves at considerable speed, and so dries the desaccharated matter.

45980. PAUL FRANKE, Plagwitz-Leipsig. *Improvements in rock cutting machines.* February 25th, 1888. In order to make the bars of sugar lie properly on the opposite blade the rollers are arranged so that they can be moved up and down. With this object the lower rollers are set in a frame actuated by an eccentric shaft, while the upper roller is set on springs in a second frame, and will consequently give slightly when subjected to pressure.

45037. PAUL DEGENER, Berlin. *Process for extracting sugar from molasses and such like by means of magnesium sulphate, alcohol, or other substances.* April 24th, 1887. If molasses, either warm or cold, and in as concentrated a condition as possible, be mixed with magnesium sulphate, magnesium sulphite, or magnesium phosphate, almost or entirely free from water, and the mixture left to harden in a dry atmosphere and then crushed to powder, sugar in a pure form can be dissolved out of it with alcohol, and from this solution pure sugar can finally be precipitated. If caustic soda be added with the magnesium sulphate a greater purity is attained, but in this case an excess of magnesium sulphate must always be added. If the mass contains water burnt gypsum should be added as long as it can be kneaded.

45679. C. FRANZEN, Köln. *Improvements in centrifugal machines for sugar loaves.* August 26th, 1887. The sugar loaf moulds are placed radially in the drum with their apices turned towards the centre. They are supported by the wall of the drum either directly or

by the interposition of an intervening piece. In the former case they are filled up; in the latter a round sieve piece fitting exactly and consisting of two perforated discs, is pushed into the mould, and fits against the surface of the sugar, and is held against the wall of the drum by means of a ribbed flange. Loose rings, fixed by means of wedges, form supports for the apices of the moulds.

45675. J. KREUTZ and F. SCHIPPER, Brünn. *Suction batteries and apparatus for claying sugar loaves and separating the syrup.* June 9th, 1888. In order to render suction batteries available for claying sugar loaves, and for separating out the syrups, they are connected with three separate syrup collectors by means of which the raw, half white, and white syrups can be separately collected. These three vessels are connected with the suction pump by means of a pipe communicating with the various receivers. In order to clay the loaves with the help of this suction battery, the moulds are placed on the said battery as soon as the sugar has stiffened and cooled; they are then smeared with a coating of cleare, and the suction pump is set in motion.

Patentees of Inventions connected with the production, manufacture, and refining of sugar will find *The Sugar Cane* the best medium for their advertisements.

The Sugar Cane has a wide circulation among planters in all sugar producing countries, as well as among refiners, merchants, commission agents, and brokers, interested in the trade, at home and abroad.

SACCHARINE.

A decree, signed by the King of Belgium, on the 21st May, levies a customs and excise duty of 140 francs per kilo. (£2 11s. per lb.) on saccharine, solid or liquid, and all products containing more than one-half per cent. thereof. Other products prepared with saccharine are to be subject to the same duties as those prepared with sugar, according to the sweetening power of the saccharine as compared with sugar.

In Spain a royal decree places saccharine amongst drugs in all cases where its use is compatible with sanitary legislation. The introduction into Spain of any alimentary substances containing saccharine is forbidden, and those who adulterate sugar, or any sweetened alimentary substances, with saccharine are to be prosecuted.

The Austrian chemist, Fr. Strohmer, in a carefully prepared paper

read before the general meeting of Austro-Hungarian sugar manufacturers at Trieste, declares that sugar manufacturers have no cause to fear any successful competition on the part of saccharine, and that it is by no means proved that its use is not more or less injurious to the human constitution.

According to the *Vienna Wochenbericht*, the Badische Anilin-Soda Fabrik, of Ludwigshafen, is about to take out a patent for another substance derived from coal-tar, viz., methylo-benzoic acid sulfinate, with a still greater sweetening power than Fahlberg's saccharine. It is stated that a single crystal filament of 2 to 3 millimetres, as fine as the finest sewing-needle, will sweeten a glass of water so strongly that the liquid has to be considerably diluted before it can be drunk.

SUGAR CANES.

INTRODUCED INTO THE FRENCH WEST INDIES FROM THE EAST INDIES.

The French a few years since, says Dr. Moseley (this was written in 1799,) introduced into their West Indian Islands plants from the East Indies. From these islands the cultivation of the East Indian cane has been carried into some of the English islands. Sir John Laforey planted them in Antigua, and has proved their present superiority over the old canes of the West Indies. He gives the following account of these canes:—

One brought from the Island of Bourbon, reported by the French to be the growth of the coast of Malabar. Another from the Island of Otaheite. Another from Batavia.

The two former are much alike both in their appearance and growth; but that of Otaheite is said to make the finest sugar. They are much larger than those of our islands, the joints of some measuring eight or nine inches long, and six in circumference.

Their colour and that of their leaves also differ from ours. They are ripe enough to grind at the age of ten months. They appear to stand the dry weather better than ours, and are not liable to be attacked by that destructive insect called the *borer*.

The Batavian canes are a deep purple on the outside; they grow short jointed and small in circumference, but bunch exceedingly, and vegetate so quick that they spring up from the plant in one-third of the time which those of our island do.

The method of propagating the sugar is by cuttings from the top of it, and we know of no other method, though Mr. Bruce says in Abyssinia it is raised from the seed. Of this fact we have no example; and it is thought Mr. Bruce is mistaken in this matter.

ESTIMATE OF THE PRINCIPAL CANE SUGAR CROPS FOR 1888-9, WITH ACTUAL CROPS OF SIX PREVIOUS YEARS.

	1888-89.	1887-88.	1886-87.	1885-86.	1884-85.	1883-84.	1882-83.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Cuba	500,000	610,000	608,900	705,400	630,800	560,900	485,000
Porto Rico	65,000	60,000	86,000	64,000	70,000	98,600	70,000
Trinidad	55,000	60,000	69,000	49,200	65,700	59,800	54,000
Barbados	60,000	60,000	65,000	44,000	60,700	56,000	52,000
Jamaica	28,000	30,000	21,000	17,000	25,000	29,500	25,000
Antigua and St. Kitt's ..	25,000	26,000	25,000	25,000	20,000	23,000	16,000
Martinique	45,000	39,000	41,000	33,000	38,800	49,400	46,800
Guadeloupe	55,000	50,000	55,000	37,000	41,200	55,300	52,000
Demerara	115,000	110,000	135,000	111,800	96,000	126,000	117,000
Reunion	25,000	32,000	32,000	35,000	36,500	37,800	34,000
Mauritius	125,000	120,000	101,800	114,200	128,000	120,400	116,700
Java	340,000	396,000	363,950	365,950	374,400	311,400	283,600
British India	60,000	55,000	50,000	50,000	45,000	60,000	87,000
Brazils	220,000	320,000	260,000	186,000	269,000	359,000	218,000
Manila, Cebu, and Iloilo ..	200,000	174,000	180,000	186,000	203,400	122,000	211,600
Louisiana	140,000	158,000	80,900	127,900	94,500	128,400	132,300
Peru	30,000	30,000	26,000	27,000	35,000	25,000	31,000
Egypt	35,000	35,000	50,000	65,000	41,000	37,000	21,000
Sandwich Islands	125,000	100,000	95,000	96,500	76,500	63,700	51,000
Total of Cane	2,248,000	2,465,000	2,345,550	2,339,950	2,351,500	2,323,200	2,107,000
" Beet	2,755,000	2,451,900	2,738,900	2,223,600	2,346,000	2,361,000	2,147,000
Cane and Beet	4,983,000	4,916,900	5,079,450	4,563,550	4,697,500	4,684,200	4,254,000

From H. Clark & Co.'s *Monthly Report*, July, 1889.

WEEKLY STATEMENT OF COMPARATIVE

For the Fifty-two Weeks,

	German Beetroot 88 o/o Prompt, free on board.			French Crystals. No. 3. c. f. i.			West India. Good Brown.			Java afloat. No. 15 and 16.		
	1888.	1887.	1886.	1888.	1887.	1886.	1888.	1887.	1886.	1888.	1887.	1886.
July 6..	11/-	12/10 $\frac{1}{2}$	13/4 $\frac{1}{2}$	11/3	11/4 $\frac{1}{2}$	17/-	13/10 $\frac{1}{2}$	14/3	12/3	11/-	11/3	15/10 $\frac{1}{2}$
13..	14/7 $\frac{1}{2}$	14/6	13/6	13/3	11/6	17/-	14/-	14/6	12/3	11/-	11/3	16/-
20..	14/6	13/-	12/7 $\frac{1}{2}$	11/3	11/7 $\frac{1}{2}$	17/-	14/1 $\frac{1}{2}$	14/6	12/3	11/-	11/3	16/-
27..	14/-	12/6	11/3	11/4 $\frac{1}{2}$	17/-	14/1 $\frac{1}{2}$	14/3	12/-	11/-	11/-	11/-	15/9
Aug. 3..	13/10 $\frac{1}{2}$	12/4 $\frac{1}{2}$	12/9	11/-	10/10 $\frac{1}{2}$	17/-	14/1 $\frac{1}{2}$	13/9	12/-	11/-	11/-	15/9
10	13/10 $\frac{1}{2}$	14/3	12/6	11/-	11/1 $\frac{1}{2}$	17/3	14/-	13/4 $\frac{1}{2}$	12/3	11/3	11/3	16/-
17..	14 4 $\frac{1}{2}$	14/3	12/7 $\frac{1}{2}$	12/9	11/3	17/3	14/-	13/4 $\frac{1}{2}$	12/6	11/3	11/-	16/1 $\frac{1}{2}$
24..	14/4 $\frac{1}{2}$	12/6	11/3	11/1 $\frac{1}{2}$	17/3	14/1 $\frac{1}{2}$	13/4 $\frac{1}{2}$	12/9	11/3	11/3	11/3	16/3
31..	14/7 $\frac{1}{2}$	14/4 $\frac{1}{2}$	12/6	12/7 $\frac{1}{2}$	11/-	10/10 $\frac{1}{2}$	17/3	14/4 $\frac{1}{2}$	12/9	11/3	10/9	16/3
Sept. 7..	14/3	14/7 $\frac{1}{2}$	12/6	12/7 $\frac{1}{2}$	11/1 $\frac{1}{2}$	11/3	17/3	14/6	13/6	12/9	11/3	10/9
14..	14/6	14/7 $\frac{1}{2}$	12/7 $\frac{1}{2}$	12/6	11/6	12/-	17/-	14/6	14/-	12/9	11/3	11/-
21..	14/6	15/-	11/9	11/7 $\frac{1}{2}$	12/9	11/9	16/9	14/6	14/-	12/9	11/3	11/-
28..	14/6	14/-	11/7 $\frac{1}{2}$	11/10 $\frac{1}{2}$	11/9	11/1 $\frac{1}{2}$	16/3	15/-	13/9	12/9	11/3	11/-
Oct. 5..	13/6	11/10 $\frac{1}{2}$	12/9	11/-	10/10 $\frac{1}{2}$	15/9	15/3	13/3	12 6	11/3	10/9	16/-
12..	13/3	12/-	11/10 $\frac{1}{2}$	10/9	10/9	15/6	14/6	13/-	12/6	11/3	10/9	16/-
19..	13/3	13/6	11/10 $\frac{1}{2}$	12/1 $\frac{1}{2}$	10/9	15/9	14/6	13/-	12/6	11/3	10/9	16/-
26..	13/3	13/1 $\frac{1}{2}$	12/6	12/1 $\frac{1}{2}$	10/9	15/9	14/7 $\frac{1}{2}$	12/9	12/6	12/-	10/9	16/-
Nov. 2..	12/9	12/6	12/6	12/7 $\frac{1}{2}$	10/11 $\frac{1}{2}$	10/3	15/9	15/-	12/9	12/6	10/6	16/-
9..	12/9	13/-	13/4 $\frac{1}{2}$	13/7 $\frac{1}{2}$	10/6	10/7 $\frac{1}{2}$	15/9	16/-	13/-	12/6	10/6	16/-
16..	13/1 $\frac{1}{2}$	13/3	13/10 $\frac{1}{2}$	13/9	10/10 $\frac{1}{2}$	10/7 $\frac{1}{2}$	15/9	16/3	13/6	12/9	13/3	10/9
23..	13/6	13/7 $\frac{1}{2}$	13/6	13/10 $\frac{1}{2}$	10/9	10/9	16/-	16/6	13/1 $\frac{1}{2}$	13/-	13/3	10/9
30..	13/3	13/6	14/3	14/6	10/9	10/10 $\frac{1}{2}$	16/1 $\frac{1}{2}$	17/-	13/3	13/6	10/9	17/-
Dec. 7..	14/3	14/4 $\frac{1}{2}$	15/6	15/3	11/6	11/1 $\frac{1}{2}$	16/9	17/9	13/4 $\frac{1}{2}$	13/6	14/-	10/9
14..	13/10 $\frac{1}{2}$	14/1 $\frac{1}{2}$	15/-	15/3	11/6	11/-	16/6	17/9	13/6	13/6	14/-	10/9
21..	13/9	14/-	15/6	16/-	11/-	16/4 $\frac{1}{2}$	16/4 $\frac{1}{2}$	18/-	13/6	11/6	10/9	17/-
28..	13/10 $\frac{1}{2}$	16/3	16/1 $\frac{1}{2}$	11/-	16/4 $\frac{1}{2}$	18/6	16/4 $\frac{1}{2}$	18/6	13/6	13/6	15/-	10/9
Jan. 4..	13/9	13/10 $\frac{1}{2}$	15/9	16/-	11/3	11/1 $\frac{1}{2}$	16/6	18/6	13/6	13/6	15/-	10/9
11..	13/9	13/10 $\frac{1}{2}$	15/6	16/4 $\frac{1}{2}$	11/1 $\frac{1}{2}$	11/1 $\frac{1}{2}$	16/6	18/3	13/9	13/6	14/8	10/9
18..	13/7 $\frac{1}{2}$	14/10 $\frac{1}{2}$	11/4 $\frac{1}{2}$	11/1 $\frac{1}{2}$	11/1 $\frac{1}{2}$	11/1 $\frac{1}{2}$	16/3	17/6	13/9	13/6	14/-	10/9
25..	13/7 $\frac{1}{2}$	13/9	14/6	14/7 $\frac{1}{2}$	11/3 $\frac{1}{2}$	11/-	16/1 $\frac{1}{2}$	17/3	13/9	13/6	14/-	10/9
Feb. 1..	13/6	13/7 $\frac{1}{2}$	14/6	14/10 $\frac{1}{2}$	11/-	10/7 $\frac{1}{2}$	16/1 $\frac{1}{2}$	17/-	13/9	13/6	13/9	10/9
8..	13/9	13/10 $\frac{1}{2}$	14/7 $\frac{1}{2}$	14/7 $\frac{1}{2}$	10/9	10/9	16/4 $\frac{1}{2}$	16/9	13/9	13/6	13/6	10/9
15..	13/10 $\frac{1}{2}$	13/10 $\frac{1}{2}$	14/1 $\frac{1}{2}$	14/1 $\frac{1}{2}$	10/9	10/9	16/7 $\frac{1}{2}$	16/3	13/6	13/6	13/-	10/9
22..	14/-	14/1 $\frac{1}{2}$	14/4 $\frac{1}{2}$	14/6	10/6	10/6	16/9	16/4 $\frac{1}{2}$	13/6	13/9	13/-	10/6
March 1..	14/3 $\frac{1}{2}$	14/4 $\frac{1}{2}$	14/6	14/7 $\frac{1}{2}$	10/7 $\frac{1}{2}$	10/9	17/-	16/6	13/6	14/-	13/-	10/6
8..	14/10 $\frac{1}{2}$	14/7 $\frac{1}{2}$	14/4 $\frac{1}{2}$	14/6	10/10 $\frac{1}{2}$	10/9	17/6	16/6	13/6	14/6	12/9	10/6
15..	15/-	15/3	14/4 $\frac{1}{2}$	14/7 $\frac{1}{2}$	10/9	10/9	17/9	16/9	13/6	14/9	13/-	10/6
22..	15/6	15/9	14/4 $\frac{1}{2}$	14/7 $\frac{1}{2}$	11/-	11/-	18/6	16/9	13/6	15/3	13/-	10/6
29..	17/3	17/4 $\frac{1}{2}$	14/1 $\frac{1}{2}$	11/-	11/3	11/4 $\frac{1}{2}$	19/6	16/9	13/7 $\frac{1}{2}$	16/-	13/-	10/6
April 5..	17/3	17/6	13/9	13/10 $\frac{1}{2}$	11/4 $\frac{1}{2}$	11/4 $\frac{1}{2}$	19/9	16/9	13/9	16/3	12/9	10/6
12..	18/6	19/3	14/1 $\frac{1}{2}$	13/10 $\frac{1}{2}$	11/7 $\frac{1}{2}$	11/7 $\frac{1}{2}$	20/6	16/9	13/10 $\frac{1}{2}$	17/-	12/9	10/9
19..	19/3	21/6	13/7 $\frac{1}{2}$	13/6	11/7 $\frac{1}{2}$	11/7 $\frac{1}{2}$	22/6	16/9	13/9	18/-	12/9	10/9
26..	20/7 $\frac{1}{2}$	23/4 $\frac{1}{2}$	13/3	13/4 $\frac{1}{2}$	11/7 $\frac{1}{2}$	11/7 $\frac{1}{2}$	24/-	16/6	13/7 $\frac{1}{2}$	19/-	12/6	10/9
May 3..	21/4 $\frac{1}{2}$	23/3	13/-	13/3	11/4 $\frac{1}{2}$	11/10 $\frac{1}{2}$	23/-	16/6	13/6	18/-	11/9	10/9
10..	20/4 $\frac{1}{2}$	21/6	12/9	13/1 $\frac{1}{2}$	11/9	11/10 $\frac{1}{2}$	21/6	16/4 $\frac{1}{2}$	13/6	18/-	12/-	10/9
17..	21/-	22/-	13/-	12/9	12/-	11/10 $\frac{1}{2}$	23/-	16/4 $\frac{1}{2}$	13/6	18/6	11/9	10/9
24..	22/-	22/9	18/-	13/1 $\frac{1}{2}$	11/10 $\frac{1}{2}$	12/-	23/3	16/4 $\frac{1}{2}$	13/6	18/9	11/9	10/9
31..	21/3	23/6	12/10 $\frac{1}{2}$	13/-	11/6	11/7 $\frac{1}{2}$	23/9	16/4 $\frac{1}{2}$	13/6	19/-	11/9	10/9
June 7..	22/3	24/6	13/1 $\frac{1}{2}$	13/4 $\frac{1}{2}$	11/9	11/10 $\frac{1}{2}$	24/6	16/6	13/4 $\frac{1}{2}$	19/-	11/9	10/6
14..	23/-	25/9	13/9	13/6	12/-	12/9	25/3	16/9	13/7 $\frac{1}{2}$	19/3	12/-	10/9
21..	24/-	26/3	13/9	12/3	13/-	13/-	25/-	16/9	11/3	19/6	12/-	11/-
28..	25/-	28/6	13/10 $\frac{1}{2}$	12/7 $\frac{1}{2}$	12/10 $\frac{1}{2}$	12/10 $\frac{1}{2}$	25/9	17/-	13/10 $\frac{1}{2}$	20/-	12/3	11/-

PRICES OF RAW AND REFINED SUGAR

July to June 1886-7-8-9.

		Tate's Cubes.			Martineau's Titlers.			Say's Loaves, f.o.b.			Lebaudy Loaves, f.o.b.		
		1886.	1887.	1888.	1888.	1887.	1886.	1888.	1887.	1886.	1888.	1887.	1886.
July	6..	21/-	19/3	20/3	20/-	17/3	18/3	18/3	15/-	16/3	18/-	—	16/-
	13..	21/-	19/3	20/3	20/-	17/3	17/6	18/3	15/6	—	18/3	15/-	16/-
	20..	21/-	19/3	20/3	20/3	17/3	17/6	18/3	18/9	15/-	18/3	—	16/3
	27..	21/-	19/3	20/-	20/3	17/3	17/6	18/3	18/9	15/-	—	—	16/-
Aug.	3..	21/-	19/-	20/-	20/3	17/3	17/6	18/3	18/6	15/-	—	—	16/-
	10..	21/6	19/-	20/-	20/3	17/3	17/6	18/3	18/6	15/-	—	18/4½	15/1½
	17..	21/9	19/-	20/-	20/6	17/6	—	18/3	18/6	15/3	—	—	15/1½
	24..	22/3	19/6	20/-	20/6	17/9	—	18/3	18/9	15/4½	—	18/6	15/3
	31..	22/3	19/6	20/-	20/3	17/9	—	18/3	19/-	—	—	15/6	—
Sept.	7..	21/9	19/6	20/-	20/-	17/9	18/-	18/3	19/-	15/6	16/6	—	15/3
	14..	21/6	19/6	20/3	20/-	17/9	—	18/3	19/-	—	—	—	15/9
	21..	21/6	19/3	20/3	20/-	17/6	17/9	18/3	18/9	15/6	—	18/6	16/-
	28..	21/6	19/-	20/-	19/9	17/6	—	18/3	18/6	—	—	—	15/6
Oct.	5..	21/-	19/3	20/-	19/6	17/6	—	18/3	18/3	15/6	—	18/-	15/6
	12..	21/-	19/6	20/-	19/3	17/6	—	18/3	18/3	15/6	—	17/6	15/6
	19..	21/6	19/9	20/-	19/3	17/6	—	18/3	18/9	15/9	—	17/6	15/6
	26..	21/-	20/-	20/-	19/-	17/9	17/9	18/3	18/3	15/-	—	17/6	15/-
Nov.	2..	21/-	20/-	20/-	19/-	19/3	17/9	17/6	18/-	16/-	15/3	17/6	14/9
	9..	21/-	21/-	19/6	19/-	19/3	19/-	17/6	18/-	17/3	15/-	17/4½	17/1½
	16..	21/3	21/3	19/6	19/-	19/3	19/3	17/3	18/3	18/-	15/-	17/7½	17/7½
	23..	21/3	21/-	19/6	19/3	19/-	17/3	17/3	18/6	18/-	—	17/9	17/7½
	30..	21/6	21/6	19/6	19/3	19/6	17/3	17/3	18/6	18/3	—	18/-	17/9
Dec.	7..	22/-	22/-	19/6	19/6	20/-	17/3	18/9	18/9	15/6	18/-	18/9	15/-
	14..	22/-	21/6	19/6	19/6	20/-	17/3	18/6	18/9	15/6	18/-	18/9	15/-
	21..	21/9	22/-	19/6	19/6	20/6	21/-	18/6	18/6	19/-	15/6	18/-	19/-
	28..	21/9	22/6	19/6	19/6	21/-	21/6	18/6	18/9	19/9	—	18/-	19/6
Jan.	4..	1889.	1888.	1887.	1889.	1888.	1887.	1889.	1888.	1887.	1889.	1888.	1887.
	11..	21/6	22/3	19/-	19/6	21/-	21/3	17/-	18/3	19/9	15/6	18/-	19/6
	18..	21/6	22/-	19/-	19/6	20/9	21/-	17/-	18/3	19/6	—	17/9	19/6
	25..	21/6	21/6	19/3	19/3	20/6	17/3	17/3	18/-	19/-	—	19/-	15/3
		21/6	21/6	19/-	19/3	20/-	20/3	17/3	18/-	—	15/6	17/6	18/6
Feb.	1..	21/6	21/3	19/-	19/3	20/-	17/3	18/-	18/3	—	—	17/4½	—
	8..	21/6	21/-	18/9	19/3	19/6	19/9	18/-	18/-	—	—	17/6	17/9
	15..	21/6	20/9	18/9	19/3	19/-	19/3	18/-	17/3	15/3	17/6	17/3	—
	22..	21/-	20/9	18/9	19/3	19/-	19/3	18/-	17/9	—	—	17/6	17/4½
March	1..	21/-	20/9	18/9	19/6	19/3	17/-	18/6	18/3	—	17/9	17/7½	14/9
	8..	21/9	20/9	18/9	20/-	19/3	17/-	19/-	18/-	—	18/4½	—	14/9
	15..	21/9	20/6	18/9	20/-	19/-	17/-	19/-	—	—	18/6	—	14/9
	22..	22/3	20/6	18/9	20/6	19/3	17/-	19/6	18/-	—	—	—	14/9
	29..	23/3	20/6	18/9	21/3	19/3	17/-	20/6	17/9	—	—	—	14/9
April	5..	23/6	20/6	19/-	22/-	19/3	17/-	20/9	17/6	—	—	—	—
	12..	24/9	20/6	19/3	23/3	19/3	17/-	21/-	17/6	—	21/-	—	—
	19..	26/-	20/6	19/-	25/-	19/3	17/-	21/3	17/9	—	24/3	17/6	—
	26..	27/6	20/9	19/-	26/-	19/6	17/-	24/9	17/6	—	—	—	—
May	3..	27/6	20/9	18/9	25/9	19/3	17/-	24/9	17/6	15/-	—	17/3	14/9
	10..	27/-	20/6	19/-	25/-	19/-	19/3	24/-	17/6	—	23/-	17/3	14/9
	17..	26/-	20/6	18/9	25/-	19/-	19/3	23/9	17/6	—	—	17/3	14/10½
	24..	26/-	20/6	18/9	25/9	19/-	19/3	24/-	17/6	—	—	17/3	14/10½
	31..	26/3	20/6	18/9	26/-	19/-	19/3	21/-	17/9	—	—	17/4½	14/10½
June	7..	26/3	20/6	18/9	27/-	19/6	19/9	24/-	17/9	—	—	17/4½	14/10½
	14..	27/9	21/-	19/-	27/6	19/9	17/-	25/6	18/-	—	—	17/9	14/10½
	21..	28/-	21/-	19/3	27/9	19/9	17/-	26/-	18/-	15/3	—	17/10½	15/-
	28..	29/-	21/3	19/3	28/9	20/-	17/-	27/-	18/3	15/-	—	18/-	—

IMPORTS AND EXPORTS (UNITED KINGDOM) OF RAW AND REFINED SUGARS.

JANUARY 1ST TO JUNE 30TH, 1888-1889.

Board of Trade Returns.

IMPORTS.

RAW SUGARS.	QUANTITIES.		VALUE.	
	1888.	1889.	1888.	1889.
	Cwts.	Cwts.	£	£
Germany	1,992,724	3,254,222	1,328,757	2,697,982
Holland	145,434	282,639	96,818	230,998
Belgium	377,986	459,833	254,993	316,986
France	2,080	98,781	1,710	83,992
British West Indies & Guiana	1,366,038	1,238,651	1,096,399	1,157,165
British East Indies	653,642	739,083	317,377	511,243
China and Hong Kong ....	.....	9,831	.....	7,139
Mauritius	133,015	147,956	94,505	155,717
Spanish West India Islands	303,938	46,400	222,923	41,890
Brazil	1,802,258	695,192	1,141,274	497,178
Java	2,406,128	727,991	1,835,271	698,218
Philippine Islands	278,531	257,805	139,200	167,804
Peru	222,309	261,996	167,648	210,745
Other Countries	320,486	413,060	226,110	350,940
Total of Raw Sugars ..	10,004,569	8,633,440	6,909,985	7,127,997
Molasses	221,555	243,348	68,100	88,325
Total Sugar and Molasses	....	....	6,978,085	7,216,322
REFINED SUGARS.				
Germany	1,583,529	2,367,095	1,380,010	2,377,728
Holland	629,867	707,003	574,849	716,175
Belgium	108,183	143,019	103,416	150,372
France	418,932	751,692	381,059	778,255
United States	29,425	8,586	27,788	7,799
Other Countries	250,090	448,248*	196,326*	413,545*
Total of Refined	3,020,026	4,425,643	2,663,448	4,443,874

EXPORTS.—REFINED SUGARS.

	Cwts.	Cwts.	£	£
Sweden and Norway	29,270	38,741	24,414	32,852
Denmark	41,294	57,299	30,503	45,882
Holland	40,740	40,010	30,092	30,420
Belgium	13,674	13,599	9,891	9,689
France	3,551	4,802	2,508	3,639
Portugal, Azores, & Madeira	42,898	25,209	31,708	18,532
Italy	43,257	43,846	32,114	37,119
Other Countries	87,279	66,093	69,920	57,166
Total of Exports	301,963	289,599	231,150	235,289

* Imported almost entirely from Russia.

IMPORTS OF FOREIGN REFINED SUGAR.

The British Sugar Refiners' Committee furnish us with the following figures, giving the imports of foreign refined sugar for the month of June, 1889, compared with the corresponding month of the two preceding years, and the average monthly imports for the year compared with those of 1886, 1887, and 1888, distinguishing the quantities of "Lumps and Loaves" from "other sorts," and giving the separate imports from each country:—

Countries from which Sugar has been Imported.	" LUMPS AND LOAVES."						" OTHER SORTS," Including Crushed Loaf, Granulated, Crystallized, &c.						TOTAL.								
	Monthly Average.			June	June	June	Monthly Average.			June	June	June	Monthly Average.			June	June	June			
	1886	1887	1888	1889	1887	1888	1889	1887	1888	1889	1887	1888	1889	1887	1888	1889	1887	1888	1889		
France.	1462	1363	1686	2053	1394	1567	2382	2688	5099	4855	4230	7081	905	5003	4150	6462	6541	5263	8175	2472	7885
Holland	3508	3780	3287	2839	4242	4235	2230	1428	2483	2675	3052	2735	3307	4936	6263	5942	5891	6928	6970	5637	
Germany & Austria . .	990	1347	1510	2971	1321	1503	2620	6534	10463	11729	16735	11283	12510	12076	7624	11810	13238	19724	12604	14013	14698
Belgium	344	562	622	944	989	414	1088	113	308	227	217	282	320	177	457	900	849	1191	1271	734	1285
United States	854	454	8	..	968	..	..	5078	2804	157	71	3290	186	13	5932	3258	165	71	4258	186	13
Russia . . . . .	..	..	..	42	30	..	249	3412	452	1959	3154	125	2463	1627	3412	455	1959	3496	455	2463	1676
Other Countries . . .	..	..	1	58	..	..	294	9	15	2	186	..	1	390	9	15	3	244	..	4	684
Total	7158	7539	7094	8887	8044	7719	8863	19362	21624	21604	27993	24947	19128	22593	26520	29163	28698	36880	33891	26842	31456

SUGAR STATISTICS—GREAT BRITAIN.

TO JULY 27TH, 1889 AND 1888. IN THOUSANDS OF TONS, TO
THE NEAREST THOUSAND.

	STOCKS.		DELIVERIES.		IMPORTS.	
	1889.	1888.	1889.	1888.	1889.	1888.
London	53	77	186	169	210	192
Liverpool ..	62	150	176	163	143	228
Bristol	1	4	36	29	34	29
Clyde	26	47	145	138	153	142
Total ..	142	278	543	499	540	591
	Decrease.. 136		Increase.. 44		Decrease.. 51	

SUGAR STATISTICS—UNITED STATES.

(From Willett and Hamlin's Circular.)

FOR THE FOUR PRINCIPAL PORTS. IN THOUSANDS OF TONS, TO THE
NEAREST THOUSAND. FOR JUNE, 1889 AND 1888.

	STOCKS.		DELIVERIES.		IMPORTS.	
	July 1st.		In June.		In June.	
	1889.	1888.	1889.	1888.	1889.	1888.
New York	25	119	56	69	61	68
Boston	3	19	10	15	12	18
Philadelphia....	3	6	28	34	28	35
Baltimore .....	..	..	..	..	..	..
Total.....	31	144	94	118	101	121
	Decrease.. 113		Decrease.. 24		Decrease.. 20	
Total for the year			584	523	582	619

NEW YORK PRICES FOR SUGAR.

From Willett, Hamlen & Co.'s Report, July 18th. 1889.

FAIR REFINING.	960/0 CENTS.	GRAN- ULATED.	STAND. A.	STOCK IN FOUR PORTS.
July 18, 1889.—7½c.	8½c.	9½c.	9c.	Jan. 1, 1889— 32,254 tons.
July 19, 1888.—5½c.	6½c.	7½-13-16c.	7½-8c.	Jan. 1, 1888— 47,798 tons.
July 21, 1887.—4½c.	5½c.	5 15-16c.	5½c.	Jan. 1, 1887—102,279 tons.
July 22, 1886.—4 13-16c.	5 7-16c.	6 3-16c.	5½c.	Jan. 1, 1886— 57,328 tons.
July 23, 1885.—5½c.	6c.	6½c.	6½c.	Jan. 1, 1885— 89,186 tons.
July 17, 1884.—5c.	5 15-16c.	6½c.	6-44c.	Jan. 1, 1884— 80,900 tons.
July 19, 1883.—6 11-16c.	7½c.	8 15-16c.	8½c.	Jan. 1, 1883— 50,297 tons.
July 20, 1882.—7½c.	8 1-16c.	9½c.	8½c.	Jan. 1, 1882— 43,927 tons.
July 21, 1881.—7½c.	8½c.	9½-10c.	9 7-16-½c.	Jan. 1, 1881— 66,999 tons.
July 15, 1880.—7 11-16c.	8½c.	9½-10c.	9½-½c.	Jan. 1, 1880— 63,558 tons.

STOCKS OF SUGAR IN THE CHIEF MARKETS OF EUROPE ON THE
30TH JUNE, FOR THREE YEARS, IN THOUSANDS
OF TONS, TO THE NEAREST THOUSAND.

Great Britain.	France. Holland		German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1889.	TOTAL 1888.	TOTAL 1887.
150	138*	9*	32*	50	16	395	616	580

*Estimate.

CONSUMPTION OF SUGAR IN EUROPE FOR THREE YEARS, ENDING
30TH JUNE, IN THOUSANDS OF TONS, TO THE
NEAREST THOUSAND.

Great Britain.	France. Holland		German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1889.	TOTAL 1888.	TOTAL 1887.
1814	452	41	437	258	352	2854	2648	2756

ESTIMATED CROP OF BEET ROOT SUGAR ON THE CONTINENT OF EUROPE
FOR THE PRESENT CAMPAIGN, COMPARED WITH THE ACTUAL CROP,
OF THE THREE PREVIOUS CAMPAIGNS.

(From *Ticht's Monthly Circular*.)

	1889-90.	1888-89.	1887-88.	1886-87.
	Tons.	Tons.	Tons.	Tons.
France.....	505,000 ..	470,000 ..	392,824 ..	485,739
German Empire ..	1,030,000 ..	990,000	959,166 ..	1,012,968
Austro-Hungary..	630,000 ..	525,000 ..	428,616 ..	523,059
Russia and Poland.	525,000 ..	510,000 ..	441,342 ..	487,460
Belgium	145,000 ..	140,000 ..	140,742 ..	135,755
Holland	47,000 ..	45,000 ..	39,280 ..	36,098
Other Countries..	58,000 ..	55,000 ..	49,980 ..	49,127
Total....	<u>2,940,000</u>	<u>2,735,000</u>	<u>2,451,950</u>	<u>2,730,206</u>

STATE AND PROSPECTS OF THE ENGLISH SUGAR MARKET.

The break-down of the Bull Ring in Magdeburg has for the time destroyed confidence in existing high prices.

With the new crop close at hand there is little doing except in futures, which are relatively very low. On the 1st July the speculative price of 88% German beet stood at 28s. At the height of the panic it fell to 19s. 9d. A slight recovery has since taken place, the present price is *about* 21s. to 22s. for old crop. The quotations for new crop are 16s. October, and 15s. November and December.

The transactions in cane kinds having all along been more real, and therefore more legitimate than those in beet; the variations in the prices of cane sugar have been comparatively slight.

The statistical position continues very strong. With the very small stocks available for the next six weeks, a reaction from the present depression may be expected during this month.

The imports of foreign refined for June amount to 31,456 tons, against 26,842 tons for June, 1888. The totals for six months are for 1889, 221,304 tons, against 151,001 tons in 1888, or an increase of 70,303 tons.

The deliveries into the United Kingdom (four principal ports) up to July 27, show an increase over the same period of last year, of 43,585 tons, and the imports a decrease of 50,967 tons.

The stocks in the United Kingdom (four principal ports) on July 27th, were 141,788 tons, or a decrease as compared with 1888, of 136,085 tons.

Present quotations for the standard qualities, as under, are :—


FLOATING:		Last Month.
Porto Rico, fair to good Refining	20/- to 21/6 against	21/- to 22/6.
Cuba Centrifugals, 97% polarization	22/6 to 22/9 ..	24/3 to 24/6.
Cuba, fair to good Refining	20/6 to 21/- ..	21/6 to 22/-.
Java, No. 14 to 15 D.S.	23/6 to 24/- ..	24/9 to 25/3.
British West India, fair brown	20/- ..	22/-
Bahia, low to middling brown	16/- to 17/6 ..	16/- to 17/6.
„ Nos. 8 to 9	18/3 to 19/- ..	18/3 to 19/-.
Pernams, regular to superior Americans ..	17/- to 19/6 ..	17/- to 19/6.
LANDED.		Last Month.
Madras Cane Jaggery	13/- ..	13/6
Manila Cebu and Ilo Ilo	13/- to 14/- ..	13/6
Paris Loaves, f.o.b.	25/- ..	26/-
Russian Crystal, c.i.f.	23/9 ..	25/6
Titlers	26/6 ..	28/6
Tate's Cubes	26/6 ..	29/-
Beetroot, German, 88%, f.o.b.	21/- to 21/6 ..	28/-

THE SUGAR CANE.

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 The writers alone are responsible for their statements.

N.B.—All communications to be addressed, and Cheques and P.O. Orders made payable to HENRY THORP, 6, Ward's Buildings, Deansgate, Manchester.

For Scale of Charges for Advertisements, see page xi.

For Table of Contents, see page i.

The following agreement has been sent to all the German sugar manufacturers for signature, and has been already signed by the representatives of the Anhalt, Brunswick, and Hanover, Halle, Magdeburg and Halberstädt Unions :—

1. Not to commence the coming campaign, if possible, before the end of September, or the beginning of October.
 2. In case this should for any reason be found impossible, to delay the sale of their products as much as possible.
-

In *The Sugar Cane* for September, 1883, we gave a description of "Stewart's Hydraulic Attachment," and one of the advantages of this system, there stated was *freedom from breakdowns*. We have just had shown to us a hammer head, weighing 2lbs., which had passed through a crushing mill with Stewart's Hydraulic Attachment; it was picked up by the manager amongst some old megass, and no person was aware that any such thing had passed through the mill.

Baron H. de Worms in answer to a question by Mr. A. Pease in the House of Commons on the 6th ult., in reference to the cultivation of sugar in Jamaica, said,—From the latest returns in the Secretary of State's possession it appears that in 1886-7 there were in Jamaica 68 estates with more than 200 acres in cane, 77 estates with between 100 and 200 acres in cane, 27 estates with between 50 and 100 acres in cane, and seven estates with between 10 and 50 acres in cane; but he has no information as to the number of properties with under ten

acres in cane cultivation. If the hon. member thinks it worth while to pursue the question further the colonial Government will be requested to prepare a special return.

Sir John Pope Hennessy will, it is stated, retire from the Governorship of Mauritius, and that the vacancy will be filled by Viscount Gormanston, at present Governor of British Guiana.

We had almost begun to look upon saccharine as having had its day and ceased to be—but it would seem it is not so in Belgium. The following we take from *La Sucrerie Belge*:—

We are obliged once more to refer to the singular position of the sugar industry resulting from the use of saccharine on a large scale.

As we said in our preceding number, the consumption of sugar in Belgium has diminished in a really incredible proportion; the refineries are selling nothing in the country, and are obliged to cease work. The deliveries are insignificant at the very time of year when there have always been the heaviest sales. The waste products and loaves, which have always been much in demand in summer, find no sale, excepting in exceedingly small quantities.

This falling off in the sale of the refined article necessarily is accompanied by a falling off in the sale of the *excédents*; the consumption scarcely exceeds the quantity necessary to meet the payments to the Treasury.

This situation cannot last; the consequences would be too grave.

One thing or the other; either saccharine must be prohibited, or the minimum of results must be reduced by half.

We have already said that the present law is an absurd one. It is not sufficiently energetic. It includes a prohibition, coupled with a permission to evade the prohibition by the impossibility of a sufficient check on fraud. The best proof is that on the one hand, the import of saccharine as given officially is nil, and on the other hand, the actual consumption is enormous. There no longer exists in Belgium any liqueur whatever, which is not sweetened by means of saccharine, and the sugar has to pay the duty in place of the smuggled saccharine.

The facility of fraud is astonishing, a simple envelope will hold enough saccharine to recoup, in the form of the duty evaded, twenty times the cost of the postage.

The present law, we repeat, is an absurd one, it leads to fraud.

The appointment of Sir William C. F. Robinson, K.C.M.G., late Governor of South Australia, as Governor of Western Australia, on the retirement, at an early date, of Sir F. Napier Broome, K.C.M.G., who has completed his term of service in that colony, is announced.

At pages 466—471 we give a list of 176 Joint Stock German Sugar Companies, with the results of the year's working for campaign, August, 1887, to July, 1888.

The total number of companies is 176; of these 7 shows losses, and 9 neither profit or loss, the balance being written off. The remaining 160 companies show profits ranging as under:—

Per cent.	Per cent.	Companies.	Per cent.	Per cent.	Companies.
	Under 5	..... 26	40 and under 50	..... 11	
5 and under 10	..... 23		50 „ 60	..... 6	
10 „ 15	..... 22		60 „ 70	..... 6	
15 „ 20	..... 17		70 „ 80	..... 1	
20 „ 25	.. . 14		80 „ 90	..... 2	
25 „ 30	..... 13		90 „ 100	..... 1	
30 „ 35	..... 8		100 and above	..... 1	
35 „ 40	..... 9				

The average price of 88 per cent. beet during the year covered by these returns was as follows:—For the first six months, 13s. 9d.; for the first nine months, 14s. 8d.; and for the whole year, 16s. 7d.

As the recent advance in prices did not commence until March, when the great bulk of the sugar had been disposed of at old quotations, the above results cannot be set down to an inflated condition of things. It will be seen that out of the 160 companies, 72 show profits from 20 per cent. to 107 per cent.

In the *Sugar Cane* for July, 1888, pages 356—361, we gave similar particulars for the previous campaign, 1886-87. In this year 36 companies either showed losses (some of them heavy) or no profits.

Last month we gave detailed reports of the working of two German Sugar Factories. We now add, for comparison, some extracts from the report presented at the annual meeting of the *Demmin* Factory, which has a share capital of M.750,000. During the last campaign it worked up 406,140 cwt. of beets, and turned out 52,312 cwt. of sugar, and 9,000 cwt. of molasses. The sale of these produced M.897,562. The working expenses were M.681,566, so that there

remained a gross profit of M.215,996, to which is to be added a credit balance of M.32,024 from the preceding year, making a total of M.248,020. This is disposed of as follows:—Interest at 5% on priority obligations of M.450,000 = M.22,500; depreciation and repairs, M.72,521; further payment on *share beets*, M.75,538; reserve fund, M.3,542; bonuses to employes, M.11,855; dividend 8%, M.60,000; balance carried forward, M.2,063. The payment for *share beets* is an extra sum of 30 pf. per cwt. paid to contractors for delivery of beets, who receive shares *pro rata* of their deliveries, and thus participate in the profits, no dividend being declared until 1 mark per cwt. has been paid for these beets.

We continue our reports of the net results of the campaign of 1888–89, drawn from the *Deutsche Zuckerindustrie* and other sources.

DIVIDENDS DECLARED.

The *Barum* Factory (share capital, M.381,750), pays 66 $\frac{2}{3}$ %, and lays by M.60,000 for new plant; *Cönnern*, 10%, and reserves M.26,270 for new buildings; *Seesen*, 10%; *Glauchitz*, 7 $\frac{1}{2}$ %; *Othfresen* and *Bredow*, each 7%; *Soest*, about 5 $\frac{1}{2}$ %; *Neuteich*, 5%; *Praust*, 4 $\frac{1}{2}$ %.

NET PROFITS SHOWN.

Gandersheim (share capital, M.443,000), shows a profit of M.320,105, probably some portion of the beets are not paid for; *Hessen* (share capital, M.396,000), profit, M.282,046, apparently nothing being written off for depreciation, &c.; *Königsutter* (share capital, M.592,500), M.254,673; *Nörten* (share capital, M.1,012,500), M.215,445; *Ottmachau* (share capital, M.750,000), M.139,590 and M.60,000 placed to special reserve fund; *Lafferde* (share capital, M.480,000), M.191,275; *Mühlberg a/E* (share capital, M.594,000), M.170,296; *Brakel* (share capital, M.1,242,000), M.130,842; *Mattierzoll* (share capital, M.342,000), M.119,688; *Nordstemmen* (share capital, M.525,000), M.109,157; *Burgdorf* (share capital, M.416,250), M.105,546; *Broistedt* (share capital, M.412,500), M.78,828; *Ottleben* (share capital, M.336,000), M.43,673; *Schackensleben* (share capital, M.570,000), M.37,200; *Balmhof Marienburg* (share capital, M.460,000), M.44,094, which is all placed to loss account, leaving M.216,117 still on the wrong side; *Broitzem* (share capital M.230,000), M.32,982, apparently no allowance for depreciation, &c.; *Liessau* (share capital M.479,400), M.31,051; *Frankenstein* (share capital M.526,000), M.22,828; *Göttingen* (share capital M.259,000), M.11,388; *Oestrum* (share capital M.363,500),

M.8,219; *Garte* (share capital M.357,000), M.6,445, after covering a loss from last year of M.5,248; *Peine* (share capital M.379,800), M.6,225; *Twülpstedt* (share capital M.400,000), about M.4,000; *Rethen* (share capital M.729,300), M.1,347, in this case the somewhat large sum of M.53,951 was written off for depreciation, &c.

BOHEMIA.—The *Gross Zinkendorf* factory declares a dividend of 25%; *Dolloplass*, 14%; the *Böhmische Zuckerindustrie Gesellschaft*, 8%; the *Erste Böhmische Zuckerraffinerie*, 9%. The situation of the Austrian market has for a long time been very unfavourable for the producers of refined sugar, and the steady fall in prices has finally induced several firms to abandon altogether the production of white sugars and turn their attention exclusively to raw sugar. In Bohemia, the factories of Budweis, Pardubitz, and Luzan; in Moravia, those of Kremsier, Raitz, and Kromau; in Silesia, that of Gross Kunzendorf; and in Lower Austria, that of Dürnkraut, will all be so transformed.

HUNGARY.—In the current campaign it should be noted that four very large establishments, supplied with everything that the latest discoveries can furnish, are commencing work. These four, viz., Hatvan, Mezöhegyes, Szerencs, and Bothfalva, will be able to use 2,000,000 metric centners of beets, and produce 200,000 quintals of sugar annually. The whole quantity required for Hungary can now be produced in her own factories.

RUSSIA.—A new factory is to be built at Obosnowka in the Kherson government.

BUENOS AYRES.—A proposal has been brought before the Provincial Assembly for establishing a beet-sugar factory, with a maximum capital of \$2,000,000 (say £40,000); a guarantee of 5% interest for five years to be given.

JAVA.—At Soerabaya a company, with a capital of fl.200,000 (£16,700) in 40 shares, has been formed to work the sugar factory of Klampok.

A Board of Trade return has recently been issued, signed by R. Giffen, showing the number of emigrants from the United Kingdom, to the different countries named, for July 1889 and 1888, also for the seven months 1889 and 1888, which we give at page 499. The total number for the seven months of 1889 is 212,173, against 251,711 for 1888, or a decrease of 44,938. The decrease to the United States is 41,633, to Canada 9,479, and to the Australian Colonies 642, as compared with 1888. To other countries there is an increase of 6,816.

The official statistics for the seven months ending 31st July, 1889, fully confirm the prevailing impression that the trade in this country has so far been decidedly more active than in the corresponding period of 1888.

The exports of British productions for the seven months of 1889 show an increase of £7,558,199, or 5·36 per cent.

The increase in the imports is even greater, being £23,183,263, or 9·51 per cent. There is an increase also, amounting to £1,431,916, in the re-exports of foreign merchandise, leaving the nett growth of imports for home consumption and stocks £21,751,347. Of the increase, or £7,558,199, shown in the exports of home productions not less than £2,203,595 occurs under the head of "raw materials," and of this nine-tenths may be set down to "coal."

The next great division of our exports in which the expansion is most marked is that of metals and machinery, the increase in which amounts to £1,995,586, or about 6½ per cent.

Taking machinery by itself the increase is £1,099,693, or not quite 15 per cent.; and if we take the comparison a year further back (1887) we have this year exported more by nearly 25 per cent. than we did then.

Some portion of the increase in the values of imports and exports must be put down to the higher prices now ruling; for instance, the amount for sugar in weight for the two years is about the same, yet the *value* for the present year exceeds that of 1888 by £2,362,114.

The following is a delightful specimen of "tall talk." It is taken from *The Sorghum Grower and Farm Guide*, for July:—

"Claus Spreckels was in Chicago last week, and he talked big to a *Tribune* reporter about his fight against the trust. He said; 'I am going to start my new refinery about July 1. It has cost me \$3,000,000, and is beyond question the largest in the world. It was a move I had to make, and since I have made it I am afraid of no man, company, or association in the refining business. From the time the trust was formed it has fought me, and, if I do say it myself, I have 'licked' it at every turn.' He also explained how he had formed a company with \$5,000,000 capital, which will erect ten beet-sugar factories in California, and will supply all the beet sugar this country will want. We hope Claus will succeed in his beet-sugar enterprise, as it would be a good thing for this country."—(sic).

ON SOME NEW PROCESSES OF SUGAR REFINING.

BY DR. EDMUND O. VON LIPPMANN.

(Communicated to the *Cöthen Chemiker Zeitung*.)

In contradistinction to the extraordinary progress made in every department of the manufacture of beetroot sugar, the refining industry has for a long time remained almost stationary. Not that there has been any want of improvements, whether in the cheapening of the cost of working or in the introduction of new and more appropriate apparatus and machinery; but the fundamental principle of the operations has remained practically unchanged, and the same as it had been for ages. Not until quite lately have new methods sprung up, the bearing and importance of which cannot even yet be fully estimated, but they undoubtedly deserve careful consideration, and hence must be submitted to a short examination.

Leaving on one side for the moment the question of priority, one of these processes is connected with the name of Steffen, already well known through his process for extracting sugar from molasses—the other with the name of Seyferth, who has for many years been noted for special activity in the technical branch of the sugar manufacture.

The fundamental principle is the same in both processes, the aim being to separate the raw sugar or *masse-cuite*—which may be looked upon as pure crystal sugar saturated with syrup—into its component parts by a methodical process of washing, obtaining on the one hand molasses and on the other hand pure sugar, adapted either for direct consumption or to serve as raw material for the refining process. As compared with the processes hitherto in use, viz., the direct melting of the raw sugar, or centrifugalling it with syrup, the material advantage sought to be obtained is the obtaining at the first jet a much larger percentage of almost pure sugar, and correspondingly reducing the quantity of the so-called *after-products*. This is most especially of importance in those manufactories where, in consequence of their geographical position, there is no outlet for after-products or coarse sugar (*farine*), they being consequently compelled to work them over repeatedly, thus very considerably increasing their expenses as well as incurring a loss of sugar.

Seyferth's process, according to a description given by Dr. Cunze, manager of the *Waghäusel* factory, consists in the employment of

paraffin oil with a boiling point of 220° to 250°. The raw sugar *masse-cuite*, after the expulsion of the syrup in the centrifugal, is at once clarified by a strong jet of paraffin oil, which so completely drives out the remainder of the syrup adhering to the crystals, that the further clearing with water (high pressure spray) either becomes quite unnecessary, or may be reduced to a minimum. The syrup and oil, in combination, run into a receiver, in which the specifically much lighter oil quickly rises to the top, separating from the heavier syrup, which is quite insoluble in it, and being at once ready for further use.

The sugar is obtained in from 20 to 30 minutes in an almost white and dry state, the weight of it representing very nearly the quantity of crystal sugar contained in the original *masse-cuite*. The latter is thus separated, not into syrup and raw sugar containing more or less syrup, but directly into syrup and nearly pure crystal sugar. Some paraffin however, still adheres to the latter, the unpleasant smell rendering the whole of the raw products of this process unfit for direct consumption. By melting and boiling, *i.e.*, the refining process, this smell is entirely removed. According to exact experiments with proportionate *masses-cuites*, and to calculations based on the special circumstances of the Waghäusel factory, the new process represents a gain of about M.2.48 per 100 kilos. (1s. 2½d. per cwt.) of raw sugar *masse-cuite*, or about 40 to 50 pf. per 100 kilos. (3d. per cwt.) of beets more than by the old one, taking in each case fixed prices prevailing at a given time.

The raw sugar destined for refining may also be put, either dry or mixed, possibly with oil thickened by melting solid paraffin, into the centrifugal and washed with paraffin oil, in which case also a higher percentage of almost pure crystal sugar is obtained, which is then fit for the fining process; the necessary clearing sugar can be obtained in the same way. Analysis showed that it was principally the alkaline salts which were removed from the ash residuum; for example, the proportion of these as compared with the lime salts rose from 100 : 5.6 to 100 : 39.1. This is, however, of no importance, because bone black has a higher property of absorbing lime salts, and hence *masses-cuites* with a small percentage of ashes are nevertheless ultimately obtained. From experiment and accurate calculation, 100 Mtr. Ctr. of raw sugar, polarising 95.8%, have hitherto produced at Waghäusel 65.24% of white sugar, 28% of after-products, and 6%

of molasses, while the new method produces 86·22% of white sugar, 4·85% of after-products, and 8·25% of molasses, so that instead of 25% only a little over 4% of the original charge goes back to be worked over again.

The net gain per 100 kilos. of raw sugar would consequently be from M.1·26 to M.1·70. In consequence the Waghäusel factory, after the successful result of operations on a larger scale (with 100 centner of sugar), have decided on at once adopting the Seyferth process. This will cost for the raw sugar factory from M.5,000 to M.6,000 (£250 to £300), and for the refinery M.100,000 (£5,000). According to the experience obtained hitherto, the fears that the smell of the paraffin could not be eliminated from the sugar, and that the volatile paraffin oil would involve great losses from evaporation, and also be liable to cause fires, also that the process was not adapted for common raw sugar and after-products, are said to be unfounded, yet these considerations at any rate would seem to require a more accurate experience in working on a large scale.

The Steffen process equally separates raw sugar or *masse-cuite* into white sugar and syrup by means of washing, but for this purpose employs only aqueous solutions of sugar of different degrees of purity, applying the principle of the counter-current. In beet sugar manufactories the *masse-cuite* is washed by direct application, but in refineries the raw sugar is in addition clarified, and then either put through the usual fining process or submitted in the form of *masse-cuite* once more to the washing process. For effecting the latter so-called *Wannen* (pans), holding eight to ten centner, are used, shaped like those employed for the strontia process, and either isolated or connected together by force-pumps. The *masses-cuites*, or raw sugar, as the case may be (the latter being mashed), are put into the pans in thin layers and steadily washed with 16 to 32 separate quantities of syrup of constantly increasing purity, each of them being applied separately, and by the aid of the vacuum made to penetrate the mass, and then separately intercepted. When in full work the ideal would be attained, if by running off the first solution as molasses, and applying the succeeding ones, of slowly increasing purity, as clearing liquor in the next operations, the last solution to consist of pure freshly-applied clearing solution, there should, finally, remain only white crystal sugar, saturated with pure liquor. Of course this cannot be attained in practice. It is not the case either that the

washed sugar (so-called *Waschgut*) consists of moist saccharose, or that the separation of the syrup is so quantitatively accurate that real molasses are obtained as the second final product. Syrups of a quotient of 70 and more are obtained (from which one to two after-products can be boiled out), and *Waschgut* of a very high but not absolute purity. The time required for the washing process is from 12 to 16 hours or more. This, however, very much depends on the quality and regularity of the composition of the raw material.

A trial with raw sugar, in which, however, in the absence of other washing liquor from preceding operations, only clearing liquor was employed, gave the following results. The quantity of raw sugar was 1,000 kilos.; polarisation, 95; water, 2.5; non-sugar, 2.5; containing therefore 950 kilos. of sugar (S.), 25 kilos. (W.), and 25 kilos. (NS.); further 380 kilos. of clearing liquor with 66% S. and 34% W., i.e., 250 kilos. S. and 130 kilos. W. There were employed, therefore, in all 1,200 kilos. S.; 155 kilos. W.; and 25 kilos. NS. The result obtained was 1,252 kilos. washed sugar, polarising 90. If we assume the remaining 10% to be water, considering the other portion as free from non-sugar, then the latter contained 1,127 kilos. of sugar and 125 kilos. of water, while the missing 73 kilos. S., 30 kilos. W., and 25 kilos. NS. passed into the syrup which ran off, from which in all 128 kilos., = 12.8% of the raw sugar was obtained; the average composition of this being 57 S., 23 W., and 20 NS., the quotient of purity being 74. From the washed sugar were obtained by centrifugalling:— 71% = 888 kilos. of white sugar, polarising 99, containing 800 kilos. of pure sugar, and 28% = 352 kilos. of liquor, which, assuming it to be equal to that originally employed, contained 66% = 232 kilos. of pure sugar. In addition, 8 kilos. of sugar were obtained in the form of droppings, making a total of 1,120 kilos. of pure sugar. As there were 250 kilos. of pure sugar introduced in the clearing liquor, we may consider that 870 kilos., = 87% of the charge, were obtained from the raw sugar. Of this quantity, 71% = 618 kilos. were in the form of solid sugar, the remaining 28% = 244 kilos. being in the form of clearing liquor, which would come into use on the process being carried on continuously. The total amount of sugar obtained was 91.6 per cent. of the sugar contained in the charge, 65.1 per cent being in the solid form. Of course the result would be different if the working were continuous and the clearing liquor used at once. Against this may be put to the credit of the process, the facts of the

washed sugar being chemically pure, and the constitution of the final clearing liquor having undergone no alteration, and all the non-sugar having passed into the syrups. As far as the working up of beetroot masses-cuites is concerned, the process has yet to stand the test, especially as we have no satisfactory experience with regard to the behaviour of low masses-cuities prepared without addition of sugar. The fact, however, has been established that in practice it is very important to employ masses-cuites of as regular composition as possible and with permanently even granulation, as the washing, which would else go on easily and without any special difficulties, is otherwise exposed to unpleasant interruption. In refining the same remark applies to the raw sugar; the more regular the granulation and composition of it, the more evenly the operation proceeds, whilst the manipulation of irregular mixtures is difficult, sometimes even impracticable, or at the best irregular. To a certain extent good may be done by previously mashing, sifting, or sorting the raw sugar.

Washed sugar may be variously employed, according to its composition. It may be used in the refinery, either just as it is or after previous centrifugalling, as addition sugar. In the process of refining, a portion of the sugar would then throw off fresh "after-products" and molasses. Another very small portion would be lost, so that the figures, as given in the above-mentioned experiment, would be diminished by at least a small percentage. It is also possible, by heating and melting the washed sugar to produce a *masse-cuite* and work it up (if necessary after previous grinding) by the usual refining processes into any kind of product desired; it is expected that in this case either no clearing liquor or only a very small quantity would be required, and that the latter would thus be reduced to a minimum. Finally, the centrifugalled sugar, or the washed mass, treated in a corresponding manner, can be converted direct into sugar for consumption, especially so-called "granulated," which is not possible with the Seyferth process, on account of the bad smell of the clarified article. Whether this technical advantage can also be considered as an advantage from a general commercial point of view cannot at present be ascertained.

The saving in cost, consequent on the introduction of the washing process, is calculated according to the article produced at 1 to 1½ mark per 100 kilos. of raw sugar (6d. to 9d. per cwt.). The process, the cost of setting up which is stated to be M. 300,000 (£15,000) for a medium-sized factory, has already been introduced in a number of

refineries, but has been only a short time in operation in the campaign now drawing to an end, partly from technical reasons, partly because in consequence of the state of the market work was brought to an early close. Consequently we shall not be able to obtain exact information either about this or the Soyferth process until the next campaign, so as to ascertain accurately to what extent the working on a large scale tends to confirm the very extraordinary expectations entertained, and to justify the heavy expenses of the patent and its application.

INTERNATIONAL SUGAR BANK.

At a meeting of the Technical Association of Sugar Manufacturers (Technischer Verein für Zuckerfabrikanten), held at Magdeburg, on the 2nd ult., Mr. Jos. Görz, of Berlin, one of the promoters of the International Sugar Bank, referred to the rather incorrect statements that had appeared in the *Deutsche Zuckerindustrie*, and explained how the project had originated.

The promoters had at first entertained the idea of giving the undertaking a very wide basis and extensive aims, endeavouring to embrace in their operations the whole of the quantities exported by the different individual countries. They were of opinion that by an arrangement of this kind it would probably be possible to obtain for the individual industries, and especially for the beet sugar industry, better results than by means of the London Convention. A resolution in this sense had even been adopted by leading manufacturers, &c., from the beet sugar districts, which had materially contributed to strengthen the English opposition to the London Convention. But with that the endeavours on this side of the question came to an end, as the Continental producers and manufacturers who had been consulted had unanimously declared that at this time it was out of the question to think of practically carrying out a measure like this, which would cut off the freedom of individual action, and any such idea must be eliminated from the programme. On this, a fresh project was drawn up by the English syndicate, for the discussion of which the signers of the Brussels resolution, after preliminary consultations with first-class firms in different countries, had been invited to Brussels. The subscribers had expressed their opinions both as individuals and also as representing leading manufacturers and merchants in the different producing countries.

The plan of the undertaking was as follows:—The Bank is to buy and sell sugar for account of third parties, make advances on sugar, keep the manufacturers and merchants, who do their business through it, regularly supplied with important business information, received through its agents from all the producing districts, and further to share its profits with its clients, but will abstain absolutely from doing business on its own account. The projected Bank is therefore purely for commission business, and for making advances, especially on sugar, and is an institution which is *a priori* debarred from every kind of speculation. The establishment of such a Bank, with a capital of 60,000,000 marks, could not be regarded, as had been the case in certain circles, as an undertaking directed against the existing sugar commission houses and banks, because the production and consumption of sugar was increasing from year to year, and therefore it became necessary every year for the sugar trade to have more capital at its disposal. The idea that the Bank would monopolise the sugar trade was also totally mistaken, inasmuch as a quantity of 5,000,000 tons of sugar annually passed through the trade of the world, which involved as raw sugar a capital of some 1,500 million marks, and of this quantity two-thirds was a second time brought into trade in the shape of refined sugar, to the value of another 1,500 million marks; in face, therefore, of this sum of about 3,000 million marks it could not by any means be said that a capital of 60 million marks would monopolise the trade, or even that such an idea was contemplated. The 60,000,000 marks brought into operation corresponded nearly with the increase in the production and consumption of sugar, and in the long run would not even suffice to provide the sugar trade with the requisite funds. But for the German industry it was very desirable to have plenty of money, and also cheap money, so that they might get advances on their sugar. It could therefore be nothing but satisfactory for the sugar industry for them to be henceforth sharers in the profits of the Bank in proportion to the business they did with it, and for their knowledge of the position of business in general to be increased and made more accurate by means of the information which they would receive from such an institution. For all these reasons the Bank must be considered a great advantage for the sugar industry, and the resolution adopted at Brussels had accordingly been clearly expressed in this direction.

BEET PRODUCTION PER ACRE IN CALIFORNIA.

PAJARO VALLEY'S BEET CROP IN 1888.

The following particulars, which are given by the *Pujaronian* (California), we take from *The Louisiana Planter and Sugar Manufacturer*:—

When Claus Spreckles came to Watsonville to secure contracts from our farmers for the cultivation of sugar beets he informed them that he would distribute \$750 in prizes among them during the first season—\$500 to the farmer cultivating ten acres or over who had the largest return of sugar per acre, \$250 to the farmer cultivating five acres who had the largest sugar yield. It has taken long and careful calculation to make the awards, but this result has been accomplished, and the lucky farmers are J. B. Hudson (who is farming Gus Sanborn's ranch), who takes the prize of \$500, and W. M. Gorham wins the prize of \$250.

So that every beet grower can learn the exact amount of crude sugar obtained per acre from his land, the Western Beet Sugar Co. has made up the appended detailed list for publication. It is valuable in its disclosures, and reveals that the rich valley lands near Watsonville produce an enormous yield of saccharine. These figures will surprise the sugar beet growers of Europe. In several instances the yield per acre is greater than ever reached in Germany or France. Land that will produce enough wheat to make a ton of flour is considered first-class; but when land will produce over four tons of sugar per acre, the results obtained are, to use a slang phrase, "paralyzing." The following is the list prepared by P. W. Moose, accountant at the beet factory:—

RAISERS OF TEN ACRES OR MORE OF SUGAR BEET.

	Average lbs. sugar to acre.		Average lbs. sugar to acre.
J. B. Hudson.....	8417	A. F. Richardson	5322
Porter & Paulsen	6634	G. M. Bockius, jun.....	5038
Trafton Bros.	6592	J. Peterson	5014
E. S. Bockius.....	6512	J. W. Connell	4765
E. Therwachter	6325	G. Pardee	4703
H. Wiley.....	6105	T. Allen	4170
L. E. Pearce	5806	K. F. Redman	4113
F. G. Tuttle	5690	J. Murphy	4091
J. Kennaugh	5511	M. Gagnon.....	4064

	Average lbs. sugar to acre.		Average lbs. sugar to acre.
J. Burke	4027	E. A. Knowles	1564
F. R. Clementine	3878	J. Hugues	1548
A. Martin	3815	W. Fay	1546
J. Foster	3778	A. Pereira	1494
O. H. Willoughby	3622	J. M. White	1430
O. Stoesser	3557	W. G. Hudson	1386
J. Crawford	3406	T. Hushbeck	1355
R. S. Williamson	3373	M. Cassin	1335
J. Ring	3308	Mrs. Chalmers	1249
G. Rianda	3304	A. Lauritzen	1244
H. H. Cowles	3168	J. Wood	1074
W. McGowen	3129	R. H. McGowan	1069
J. E. Trafton	3086	B. Phillips	1052
C. D. Trafton	3022	J. Driscoll	1023
A. W. Condit	2997	J. Sheehy	1014
S. Rianda	2964	T. Crowley	959
J. W. Snyder	2781	Waters & Brewington ..	787
D. Driscoll	2715	Safstrom & Donnelly ..	786
C. H. Connell	2649	R. K. Dickson	718
C. Kuhlitz	2636	J. M. Clark	713
C. Mann	2609	J. Royse	695
W. Royse	2517	W. T. Gileky	496
D. M. Clough	2434	E. H. Walker	473
D. H. Burson	2295	N. Johnson	472
W. J. Williamson	2292	T. McCarty	422
J. S. Manasco	2239	A. V. Bush	412
M. Grimes	2236	C. Capelli & Co.	371
T. Sheehy	2209	W. Sandholdt	370
T. Kennedy	2206	A. Rinda	347
J. M. Grimmer	2116	B. Galligau	315
J. T. Porter	2086	J. McGowen	229
E. White	2003	J. Paulsen	228
C. Jessen	1990	N. F. Mansfield	214
E. Ferguson	1773	J. B. White	202
S. Lasher	1647	L. P. Helmer	191
T. Kearns	1625	C. Storm	181
J. Cane	1620	A. Holm	137
A. Hugues ..	1612	L. Brendt	104

	Average lbs. sugar to acre.		Average lbs. sugar to acre.
N. Paulsen	89	G. W. Sill.. 10 acres, produced	
E. Mann	54	nothing	
A. P. Roache	22	W. P. Ball.. 20 acres, produced	
L. Hansen	20	nothing	
J. Nistetter....	10	C. Doyle .. 10 acres, produced	
J. P. Cox.. 75 acres, produced		nothing	
nothing			

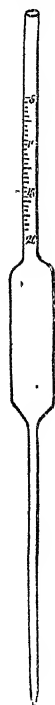
RAISERS OF FIVE TO TEN ACRES OF SUGAR BEETS.

	Average lbs. sugar to acre.		Average lbs. sugar to acre.
W. M. Gorham	7652	J. C. Drew	1751
T. Mitchell	7005	M. A. Hudson	1745
M. Tuttle	5433	A. Swass.....	1308
J. Castello	5349	W. T. Rowe	1214
C. O. Silliman ...	5149	M. S. Sylvera.....	1211
J. C. Short	4843	Menker & Pine	1207
O. Tuttle	4840	J. H. Thompson....	1152
G. D. Rodgers	4672	H. Hardy ..	1124
Mrs. Thompson	4267	J. Ryan	1111
W. Tuttle	3830	S. B. Marcus	1072
T. Leland	3512	J. B. Housh	722
T. Regan.....	3167	J. Morgan	633
W. Y. Clark	2740	M. Marshall	605
R. Bradley	2600	J. E. Lindair	588
P. McAllister.....	2554	Lillienclanz	548
M. Quirk.....	2218	S. R. Wilson	520
H. Frapwell	2175	G. W. Hunter	481
M. Donnelly	2128	J. R. Gilkey	328
A. Lewis.....	1852	J. B. Short.....	294
C. Hushbeck	1844	J. C. Seston	185
G. W. Rowe	1765	J. Struve.....	160
R. M. Reid.....	1754	H. Siegman	131

A CONVENIENT FORM OF PIPETTE FOR MEASURING OUT BEET, CANE AND SORGHUM JUICES FOR POLARIZATION.

BY C. A. CRAMPTON.

In Bull. No. 15, Chem. Div. U.S. Dept. Agr., I have described the method of procedure followed by the analysts at the stations of this Department in the analysis of juices. For polarization it has been the custom to measure out a sample of juice, as it would require too much time to weigh, and for this purpose it has been the custom to



measure out 50 cc. with a pipette, making subsequent correction of the polarization for the specific gravity of the juice. When the polariscope used is one that has the factor 26.048, that it requires 26.048 gms. of pure sugar, dissolved and made up to 100 cc. of water to read 100 on the scale, it will be seen that 50 cc. of juice gives a weight in grams very nearly twice the normal amount to be taken for the instrument, or 52.096. Last year I had some pipettes made, which were graduated in the stem from 48 to 54 cc., with subdivisions of 0.5 cc., to be used in measuring out directly the correct amount of juices of different densities, to give double their polarization; the number of cc. to be used for each density to be ascertained from a table. These pipettes were used during the present sugar campaign in Louisiana by Mr. G. L. Spencer, at Magnolia Station, who found them very convenient. He has calculated a table to be used in connection with them.

I have had made recently a modification of this pipette, which does away with the necessity of a table, and which is illustrated in the accompanying cut. It is graduated from 48.1 to 51.1 cc., the subdivisions being in tenths of a cubic centimeter, but the divisions are marked instead with degrees Brix, having a range from 5° to 20° each, 0.1 cc. division corresponding to 0.5° Brix. That is, after the degree Brix of a juice has been ascertained, the pipette, when filled up to the corresponding mark on the stem, will deliver 52.096 grams of the juice (within a few milligrams, which is as close as it is possible to weigh it out). So it is necessary to divide the polarization by two, or to read the solution in a 400 mm. tube, to give directly the per cent. of sucrose in the juice.

The calculation for the graduations is taken from Stanmer's table for specific gravities and corresponding degrees Brix. For commercial work these pipettes will weigh out the juice with sufficient accuracy, and I think they will prove convenient for rapid work, and save considerable time in the calculation of results.

STATISTICS, SHOWING THE RESULTS OF THE SHARE-HOLDING SUGAR COMPANIES IN GERMANY FOR 1887-88.

For the following particulars we are indebted to the *Deutsche Zuckerindustrie*. The share capital and the amount of beets worked up being given, our readers will be able to better estimate the importance of the profits and losses, which are also stated.

Name of Manufactory.	Share Capital.	Quantity of Beets worked up.	Price of Beets per Cwt.	Written off.	Profit.	Loss.
	Mk.	Cwts.	Pfg. (¹)	Mk.	Mk.	Mk.
Aderstedt..	989,625	672,340	125 (¹)	60,681	203,712	....
Alstedt-Schellerten ..	495,000	426,990	110	32,415	152,186	....
Algermissen ..	450,000	311,160	120	31,028	90,600	....
Altenau b. Schöppenstedt	450,000	288,980	100	....	175,430	....
Altfelde ..	600,000	413,360	75	60,541	51,374	....
Alt-Jauer ..	1,500,000	553,010	95	82,125	291,821	....
Ameln ..	900,000	386,950	122	68,093	36,382	....
Anklam..	500,000	460,294	89	177,697	143,208	....
Badersleben ..	453,750	341,250	90	37,715	260,232	....
Badische Gesellschaft Waghäusel ..	4,714,286	848,629	....	146,321	720,368	....
Barum ..	381,750	465,610	109	17,814 (²)	363,930	....
Bauerwitz ..	655,200	....	....	50,000	83,520	....
Bedburg ..	666,000	520,700	96	46,947	125,742	....
Bennigsen ..	683,100	422,780	105	60,600	164,008	....
Bernstadt ..	705,000	348,000	88	95,025	13,120	....
Böblingen ..	1,086,714	92,774	....	....	7,669	....
Bockenheim..	578,400	248,700	87	52,967	61,869	....
Brakel ..	1,242,000	581,890	104	46,866	80,323	....
Bredow ..	1,200,000	405,810	100	40,973	153,480	....
Brehna..	412,000	287,460	85	15,328	241,659	....
Broistedt ..	412,500	326,610	98	81,462	127,619	....

Broitzem	230,250	170,055	88	59,735	64,913	....
Brühl	1,050,000	1,035,000	118	40,243	31,585	....
Burgdorf	416,250	276,940	113	35,591	61,531	....
Camburg	700,000	560,650	113	30,000	295,796	....
Clauen	450,000	279,700	141 ^(*)	17,000	78,648	....
Cönnern	180,000	205,080	128	167,403	361,115	....
Culmsee	1,300,000	2,025,930	85	80,113	147,012	....
Demmin	750,000	415,250	85 ^(*)	43,518	206,172	....
Deßau	300,000	310,680	....	84,908	216,569	....
Dirschau	450,000	507,070	85 ^(*)	90,245 ^(*)	59,399	....
Dirschau-Ceres	599,750	421,040	85	13,007	92,474	....
Döbeln	690,000	391,260	99	28,021	88,126	....
Droheln	150,000	180,350	100	36,799	557	....
Duderstadt	354,750	106,940	....	112,578	....	....
Ebeleben	546,457	268,830	70 ^(*)	87,571	115,529	....
Eichthal	315,000	....	....	61,806	145,852	....
Eilenstedt	600,000	340,000	143	37,847	35,518	....
Eilsleben	802,500	604,070	119	19,552	1,017^(*)	....
Emmerthal	790,500	365,210	103	44,294	46,370	....
Equord	192,900	200,400	106	46,992	306,647	....
Etgersleben	219,500	204,870	98	91,500	23,926	....
Fallersleben	772,500	519,500	96	36,161	267,595	....
Frankenstein	526,000	246,470	....	42,550	30,300	....
Fraustadt mit Raffinerie Glogau	1,100,000	656,580	....	97,118	....	....
Gandersheim	443,400	305,350	100	24,631	355,477	....
Garte	357,000	261,930	84	67,501	....	2,829
Glauchig	4,500,000	482,390	120	16,621	1,340^(*)	....
Görschen	500,000	291,850	94	40,000	126,217	....
Göttengen	269,000	328,390	104	18,344	109,682	....
Grossen	472,500	....	....	47,057	13,530	....
Gronauer Rübenzuckerfabrik	360,000	224,680	135 ⁽¹⁰⁾	60,281	62,673 ⁽¹¹⁾
Gross-Ammensleben	320,000	331,120	105	71,622	141,579	....
Gross-Dungen	540,000	....	....	....	49,353	....
Gross-Gerau	530,000	216,900	101	....	....	....
Gross-Mahner	416,100	....	....	....	....	....

STATISTICS OF THE SHARE-HOLDING SUGAR COMPANIES IN GERMANY FOR 1887-88.—Continued.

Name of Manufactory.	Share Capital.	Quantity of Beets worked up.	Price of Beets per Cwt.	Written off.	Profit.	Loss.
	Mk.	Cwts.	Pfg.	Mk.	Mk.	Mk.
Gross-Peterwitz	639,900	327,610	....	44,322	43,329	....
Güstrow	836,500	650,377	93	46,377	104,413	....
Hadmersleben	780,000	1,137,930	....	56,634	54,791	....
Harsum	675,000	348,800	....	29,637	17,391	....
Hasede-Förste	272,700	160,000	....	35,755	....	11,844
Haynau	800,000	201,000	95	63,293	83,484	....
Heckingen und Neundorf	214,000	300,000	110	111,360	101,485	....
Hedwigsburg	465,375	402,880	98	65,995	174,787	....
Heilbron	1,660,714	304,000	111	105,560 ^(1,2)	306,611	....
Hessen	396,000	620,750	116	76,782	328,734	....
Hohenameln	300,000	214,800	100	37,355	19,346	....
Holersdorf	297,000	374,870	100	21,940	205,430	....
Holzminnen	344,400	177,280	77	22,610	13,304	....
Hornburg	300,000	330,760	100	16,503	128,000	....
Hünfeld	377,700	89,200	100	13,470	—	40,774
Innendorf	330,000	287,860	102	15,881	184,756	....
Klein-Wanzleben	2,700,000	397,310	98	204,575	247,985	....
Kützow	855,000	470,180	94	119,965	105,183	....
Königsutter, Aktien-Zuckerfabrik	240,000	357,990	90	35,709	256,495	....
Königsutter vorm. Rubland	592,500	382,200	115	28,047	184,446	....
Körbsdorf	2,700,000	532,520	93	28,058	271,509 ^(1,3)	....
Kosten	917,500	517,230	97	43,612	218,065	....
Kruschwitz	1,500,000 ^(1,2)	699,700	93	162,598	179,809	....
Kujavien	900,000	749,300	105	82,922	158,362	....
Lafferde	480,000	351,000	95	46,952	166,950	....
Langenweddingen Aktien-Zuckerfabrik	240,000	216,336	100	10,138	86,844	....
Lehrte	263,400	316,810	88	34,033	25,959	....
Lüssau	479,400	360,623	80	26,382	74,678	....

Linden-Hannover	464,400	539,250	100	78,361	114,198	...
Lippische Zuckerfabrik Lage	625,000	329,490	100	46,757	63,778	...
Lobau (Oberlausitz)	1,200,000	330,620	109	77,811	171,901	...
Mangau	702,000	352,070	102	28,080	111,490	...
Malchin	600,000	865,185	101	34,414	431,522	...
Marienbergr, Bahnhof	460,000	243,910	80	40,612	10,314	...
Mariensstuhl bei Egehn	300,000	491,010	126	29,461	120,766	33,072
Marienwerder	519,600	284,790	70	11,069	...	...
Markranstädt	450,000	318,260	88	110,780	80,670	...
Mattierzoll	342,000	566,790	113	37,171	181,238	...
Melno	594,500	443,440	75	120,695	...	...
Mescheriner Zuckerfabrik	596,000	447,260	95	70,255	116,730	...
Mühlberg a. E.	582,000	427,620	106	74,475	300,049	...
Münsterberg	1,000,000	...	...	...	...	...
Münzel-Holstensen	300,000	166,695	51	24,589	...	38,523
Nakel	699,600	420,300	121	52,290	19,136	...
Neuhaldensleben	723,375	464,000	110	45,429	83,799	...
Neu Schönesee	600,000	361,840	80	55,434	33,977	...
Neustadt in Oberschlesien	750,000	287,080	800	42,374	71,825	...
Neuteich	600,000	475,330	82	43,395	87,756	...
Neuwerk (Sarstedt und Gehrdén)	1,500,000	654,970	100	63,880	259,552	...
Niederndodeleben	450,000	247,485	115	21,889	1,415	...
Niederthone	460,000	...	...	33,437	35,884	...
Nordgarnersleben	504,000	683,080	115	123,464	252,000	...
Nordstammen	525,000	589,420	105	69,036	109,157	...
Nörten	1,012,500	924,240	116	38,298	300,063	...
Northeim	1,050,000	799,140	116	40,367	243,178	...
Obernjesa	750,000	376,310	103	49,473	49,408	...
Offstein	621,200	212,200	96	23,781	57,031	...
Oldendorf Bahnhof Osterwald	370,800	328,010	115	52,204	2,142	14,294
Oldesloe	581,500	155,102	...	...	...	...
Oelsburg	270,000	189,795	113	136,143	308,404	...
Opaleniza	1,100,000	844,810	...	52,234	3,000	...
Oschersleben	720,000	589,070	...	...	...	...
Osternwick	412,200	391,620	...	...	...	...

STATISTICS OF THE SHARE-HOLDING SUGAR COMPANIES IN GERMANY FOR 1887-88.—Continued.

Name of Manufactory.	Share Capital.	Quantity of Beets worked up.	Price of Beets per Cwt.	Written off.	Profit.	Loss.
	Mk.	Cwts.	Figs.	Mk.	Mk.	Mk.
Oestrum	363,500	176,350	106	31,017	22,541	....
Othfresen	343,200	232,480	95	50,000	47,048	....
Ottleben	336,000	....	....	48,340	73,887	....
Ottmachau	750,000	....	....	27,018	70,888	....
Pakosch	700,000	338,870	91	70,974	....	67,373
Papenteich	410,000	197,380	82	25,255	71,181	....
Peine	379,800	378,300	120	24,772	5,507	....
Pelplin	600,000	544,840	88	63,558	209,241	....
Praust	750,000	274,290	88	65,555	73,318	....
zur Rast	379,800	201,390	115	21,862	62,078	....
Rastenburg	600,000	389,180	86	58,344	72,119	....
Rautheim	300,000	332,720	100	32,943	20,399	....
Reinstedt	213,000	....	....	12,547	809	....
Rethen	729,300	502,000	....	53,951	3,783	....
Rhein. Aktien-Verien, Köln (incl. d. 2 Raffinerien Köln)	6,000,000	585,060 ⁽¹⁴⁾	263,428	257,645	....
Riesenburg	560,000	271,600	56	37,555	28,486	....
Ringelheim	360,000	303,445	98	24,092	106,075	....
Rostocker Aktien-Zuckerfabrik	600,000	425,820	101	27,025	172,977	....
Schackensleben	562,500	395,310	....	50,038	42,776	....
Schaumburg in Oldendorf	427,200	177,405	84	24,494	27,476	....
Scheune	479,500	206,070	....	63,137	112,592	....
Schladen	800,000	572,570	105	63,636	312,893	....
Schöppenstedt	399,000	690,560	150	75,907	275,288	....
Schwetzwitz	790,400	334,860	97	51,249	11,679	....
Seesen	371,250	219,500	95	23,929	47,916	....
Sehnde	520,200	345,540	107	45,832	26,303	....
Sobowwitz	591,000	374,470	81	79,234	33,196	....
Soest	1,200,000	456,800	110	52,746	86,671	....
Söllingen	240,000	....	....	....	....	....

Stavenhagen	777,000	353,050	100	50,842	120,851	...
Strassburg U.-M.	750,000	679,155	91	159,385	196,329	...
Stuttgart	1,320,000	208,000	...	56,220	30,924	...
Thiede	360,000	397,730	119	67,825	77,425	...
Tiegenhof	492,600	391,017	70	20,647	24,753	...
Trachenberger Zuckersiederei	600,000	414,000	90	20,708	240,773	...
Tuzno	588,000	482,440	84	55,621	195,907	...
Twilpstedt	400,000	239,240	90	29,785	13,204	...
Uelzen	790,500	552,720	108	61,002	68,891 ⁽¹⁶⁾	...
Ummendorf	372,600	395,000	131	25,507	5,196	...
Unislaw	429,600	367,900	78	49,036	84,194	...
Uslar	366,000	142,310	80	34,793	6,978	...
Vechelde	300,000	197,785	77	14,668 ⁽¹⁷⁾	132,746	...
Vienenburg	499,000	352,140	100	36,811	67,508	...
Wabern	600,000	635,250	100	33,223	113,229	...
Warburg	1,063,500	464,080	102	50,100	2,079	...
Wefenstedt	471,000	372,480	129	15,140	109,900	...
Weetzen	690,000	433,640	144	46,362	5,849	...
Weferlingen	1,027,000	733,800	120	84,691	257,150	...
Wegeleben	1,248,000	962,560	...	61,529	395,829	...
Wendessen	367,500	275,460	100	75,967	141,397	...
Wetterau	855,200	464,530	105	49,571	130,611	...
Wewlinghoven (Gilbacher Zuckerfabrik)	600,000	460,500	100	15,919	165,866	...
Wierthe	270,000	216,800	99	112,922	121,082	...
Wierzchoslawice	1,002,000	...	...	103,562	...	...
Wreschen	675,000	346,390	...	103,706	71,101	...
Zduny	900,000	272,560	86	45,319	57,626	...
Zülz	817,200	240,000	99	55,824	43,678	...

(9) The profit is the remains of a balance from preceding year.

(10) Cost of shareholders' beets.

(11) Including a balance of M. 8.

(12) Of this M. 85,900 extra written off.

(13) Exclusive of interest.

(14) M. 1,200,000 a preference-share loan.

(15) Besides 719,000 ctr. of raw sugar.

(16) Including del credere fund, &c.

(17) M. 6,940 extra written off.

(1) Shareholders' beets, M. 1-60; bought beets, M. 0-60.

(2) M. 93,928 extra were written off from profits.

(3) Shareholders' beets, M. 1-76; extra beets, M. 1-10; bought, M. 0-85.

(4) Shareholders' beets, M. 1-15; bought do., M. 0-85.

(5) Beets, delivery up to Nov. 10, M. 0-80; later, M. 0-90.

(6) M. 12,112 extra written off.

(7) Shareholders' beets, M. 0-80; bought do., M. 0-60.

(8) Of this sum M. 141 brought from last year.

COLONIAL REPORTS FOR THE PAST YEAR.

A number of Reports have recently been issued through the Colonial Office, from our Colonies. These annual reports are, as a rule, drawn up by Colonial Officials and abound with instructive details. We take the reports from Jamaica, Trinidad, and the Bahamas.

JAMAICA.

The report from Jamaica is, on the whole, a decidedly encouraging one. There are, indeed, two reports—one from Sir Henry Norman on leaving the colony, and the other from Sir Henry Blake shortly after assuming the governorship. Though the year started with a deficit, the revenue covered both deficit and expenditure, leaving a surplus of £30,000. About one-half of the revenue of the colony is derived from import duties. Still the debt goes on increasing, and is now over £1,500,000. Half of this is railway debt, and it remains to be seen whether the new railway arrangements will improve matters. The railway expenditure of the year amounted to 61·72 per cent. of the total receipts. Education shows great progress both in the number of schools and in the number of pupils attending them. The total number of immigrants, mostly East Indian, in the colony at the end of the year was 13,066, and of these 1,002 were serving under indenture, and 1,858 had not completed a residence of ten years. There were no fresh immigrants during the year, owing apparently to the difficulties connected with their introduction. A remarkable increase in trade, both imports and exports, is shown during the year. The imports were valued at £1,695,605, an improvement on the best of the nine preceding years; and the exports at £1,828,590, also considerably in excess of any of the nine preceding years. This marked improvement is chiefly the result of increases in cocoa, cocoanut, coffee, bananas, oranges, ginger, sugar, and logwood. While sugar has decreased from 31·7 of the total exports of island produce in 1883-84 to 17·3 in 1887-8, it is gratifying to find that coffee has increased from 7·3 to 19·3, and fruit from 10·3 to 21·2 of the export of island produce. It is noteworthy that the trade of the colony with the United Kingdom has decreased from 66·5 of the total in 1880-81 to 40·2 in 1887-8, while that with the United States has grown from 18·9 to 43·2. On the whole, the year has been one of much benefit to the cultivators of the soil generally, while the

steady extension of the means of locomotion seems to be improving the social conditions.

TRINIDAD.

Trinidad is a sugar colony, but happily it has other staples which show a large increase in out-put, thus making up for the deficiency in the sugar crop. The export of sugar in 1888 amounted to £724,163, as against £800,595 in 1887. But the total exports in 1888 amounted to £2,132,761, as compared with £1,870,612 in 1887. The cocoa crop was an excellent one, the export being valued at £611,876, as compared with £354,420 in 1887. Among the other exports, asphalte, bitters, cocoanuts, and molasses figure for considerable sums. The revenue, £480,522, is in excess of the previous year by £24,355, and of the expenditure by £17,000, though the latter was nearly £39,000 more than in 1887. Trinidad has a debt of £552,680. Coolie labour is largely used in Trinidad; 1,860 immigrants having been introduced from India in 1888, while 435 returned, after serving their terms. It argues well for the treatment of these immigrants that many of them renew their contracts after their time has expired, while others return to settle in the colony after having gone home. A new steam service has been established round the island, touching at Tobago and direct into New York, in connection with the fruit trade, which is a growing one. It is, moreover, hoped, to extend the railway system, and so bring the capital and the seaboard into communication with the fertile districts of the interior. The resources of Trinidad are certainly capable of great development.

THE BAHAMAS.*

The most salient points in Sir A. Shea's report on the Bahamas is the extent to which the cultivation of Sisal hemp is being introduced. Land is being extensively taken up for this purpose, and capital introduced from the outside. At the same time, it is to be hoped that other cultures will not be neglected, and that pineapples and other fruits will receive increased attention, as well as the sponge fishery. A "one-culture" colony is always in a risky condition. In other respects the report from the Bahamas is satisfactory.

* In the April *Sugar Cane*, page 184, will be found a letter from Sir A. Shea, on fibre cultivation in these islands.

RESOURCES OF CEYLON.

Mr. W. S. Caine, M.P., in his interesting account of his Trip Round the World in 1887-8, which has recently been published, gives some valuable particulars respecting Ceylon. Coffee, which so recently as 1870 was an important industry in Ceylon, the exports at that time exceeding £4,000,000 in value, is now almost a lost industry, so far as Ceylon is concerned, whilst tea, the exports of which in 1876 were but 23 lbs., are now more than 14,000,000 lbs.!

Mr. Caine says:—"We have been in possession of the Island of Ceylon since 1815, when we finally subjugated the savage ruffian who was then the King of Kandy. My friend Mr. John Ferguson kindly furnished me with some particulars which he had carefully compiled, showing the condition of the island at that time, and which, compared with the statistics of the Blue Book for 1886, give striking evidence of the material prosperity which sixty years of British rule brings to such a country as Ceylon, and such a people as the Cingaleses and Tamils, which form its population.

I give a few of these facts in comparison one with the other.

	In 1815.	In 1886.
Population	750,000	3,000,000
Number of houses	20,000	500,000
Military force required	6,000 troops	1,000
Revenue	£226,000	£1,300,000
Imports and exports	£546,000	£8,400,000
Roads	Sand and gravel tracks only	2,250 miles of good roads
Railways	None	183 miles
Tonnage of shipping	75,000 tons	4,000,000 tons
Expenditure on education..	£3,000	£70,000
Health expenditure	£1,000	£60,000
Post Offices	4	130
Area under cultivation	400,000 acres	3,100,000 acres
Live stock	250,000 head	1,500,000 head
Carts and carriages	50	20,000

But besides, there are in the island 1,100 miles of telegraph, a Government savings bank with 10,000 depositors, 120 excellent hospitals and dispensaries, with a first-rate medical College for natives. If Ceylon had remained under the rule of the Kandyan kings none of this progress would have been visible. Ceylon is a

purely agricultural country, as its list of exports clearly show. The following is a short list of the exports of some of the principal crops of Ceylon for 1886 :—

	£
Cardamoms	22,000
Areca nuts.....	100,000
Quinine.....	300,000
Cinnamon and cinnamon oil	115,000
Cocoa nuts and fibre	70,000
Cacao.....	40,000
Coffee	600,000
Cotton	20,000
Cocoa-nut oil	24,000
Tea ..	370,000
Tobacco.....	80,000

Fifteen years ago the great staple crop of Ceylon was coffee, which, in the years 1868, 1869, and 1870, reached an average export of £4,000,000. This industry is, unhappily, being slowly destroyed by a minute fungus which has attacked the leaf, working deadly mischief all over Ceylon, and especially in the young plantations which, at a capital outlay of nearly £3,000,000, were brought under coffee cultivation in the years 1870-74. The slow but sure destruction of this valuable industry is shown by the list of exports from 1877 to 1886, which are as follows, in cwts. :—

Year.	Cwt.	Year.	Cwt.
1877	620,000	1882	260,000
1878	825,000	1883	323,000
1879	670,000	1884	315,000
1880	454,000	1885	224,000
1881	564,000	1886	180,000

Many of the coffee planters of Ceylon have been hopelessly ruined, and if it had not been possible for the valuable cleared lands to be brought under other profitable crops, it would have gone hard with the colony. The planters of Ceylon are shrewd industrious men, with a large Scottish element among them, and they seem to be finding their salvation in tea and quinine.

In 1872 there were not 500 acres of chinchona (quinine tree) in all Ceylon, with an export of bark not reaching 12,000 lbs. ; while to-day there are at least 30,000 acres under cultivation, with an export of 14,000,000 lbs. of bark.

In 1876 the exports of tea were 23 lbs. ! This year they will exceed 14,000,000 lbs., and Ceylon bids fair to rival the most important districts in Northern India in its tea-growing capacity. The teas are of a high character, fine flavour, and perfectly pure, and I see no reason why India and Ceylon should not in course of time supplant China teas to a very large extent. I visited several of the finest tea plantations in Ceylon, and in many cases found the young tea plants growing up in a forest of stumps, all that was left of what was once a valuable coffee estate, destroyed by the fell fungus. Tea will prove of greater value to the colony than coffee growing, as it employs rather more than twice the number of hands per acre. I should think that there are few better opportunities open to a young Englishman with a little capital than to come out to Ceylon, serve a two or three years' apprenticeship to tea growing, and then start an estate for himself.

Other coffee planters are turning their attention to the cacao tree, on which the bean grows which gives us our cocoa and chocolate. The export of this product has grown from 10 cwt. in 1878 to 14,000 cwt. in 1886, and is likely, in a very few years, to reach ten times this amount. Cardamoms have risen in the same space of time from 14,000 lbs. to 240,000 lbs. It will be readily seen from these figures that although the destruction of the coffee tree has been disastrous to a large number of planters, the colony is recovering itself with great buoyancy, and is probably more solidly prosperous to-day than at any previous period of its history.

The only industry in Ceylon which is not agrarian, is plumbago mining. This is entirely in the hands of the Cingalese, who work mines up to 300 feet in depth in a very primitive fashion, obtaining some £350,000 worth of the finest plumbago in the world.

It appears to me, in the short visit I have been able to pay to this interesting tropical colony, that its main dependence in the future must be on tea, and the best authorities tell me that the export will in a very few years reach thirty or forty million pounds, worth some two millions sterling. I am also told by coffee planters that the ravages of the disease is abating, and that the colony will be able to produce in future an average export of coffee of about one million sterling, or one-fourth of what was produced at the highest period of its prosperity. It is quite evident, however, from the figures I have

given, that the deficit of three millions on coffee is fast being overtaken, and that the general prospects of Ceylon agriculture are bright enough.

There is no doubt that the change of culture in Ceylon from coffee to tea will be of great benefit to the masses of the population, from the largely increased employment which it will afford. Almost all the plantation labour is carried on by Tamils, from Southern India, the Cingalese refusing to do coolie work, devoting themselves entirely to trading, small farming, carting produce (a large industry), and to handicrafts. To these Tamils Ceylon is a heaven upon earth. In their own country their average earnings per family of five reaches about £6 in the year, or less than 1d. per head per day, a condition of things that appears almost incredible to English minds, and in which recurrent famines, terrible in their results, are certain. The Tamils employed on a Ceylon tea estate have the wealth of Croesus compared with their relatives at home. They have good huts, cheap food, small gardens, medical attendance, and can earn from 6d. to 9d. per day. I doubt if, considering the climate and cost of living, there are any labouring classes in the world better off than the Tamil families settled on the plantations of Ceylon.

The revenues of the colony average about £1,000,000, of which £650,000 comes from taxation, and £350,000 from land sales, railways, and other miscellaneous receipts. The expenditure is slightly in excess of revenue for 1886, being £1,040,000. The public debt is $2\frac{1}{2}$ millions, and has been incurred for Colombo harbour, railway extension, water works, &c.

The trade of Ceylon, as everywhere else in the East, is overwhelmingly in the hands of the English. Of 6,341 vessels entered and cleared last year at Ceylon ports, 413 only were foreign, 4,928 were British.

Of £6,500,000 of commerce in the year 1886, foreign countries got £780,000, while £5,720,000 fell to the British. And yet the Conservative caucus in England passed last year, amid loud acclamations, a resolution condemning the Free Trade policy which makes and keeps us supreme in every neutral market in the world, and enables us to open our own ports and those of India and our Crown Colonies to the commerce of other rival nations with impunity, and without a single protective duty.

Ceylon gets on without a poor law. A very few old persons get a

charitable allowance from the Government, varying from 2s. to 25s. each per month, but it amounts to very little on the whole. Employment is plentiful, the people are thrifty, the cost of living is extremely small, and the young and strong are glad to care for the aged and weak.

The Local Government of Ceylon consists of the following Boards:—

1st. *The Executive and Legislative Councils*, which are of the same composition and exercise the same functions as I have already described with regard to Hong Kong or Singapore. None of the members are elective, but there is always a Cingalese and a Tamil member on the Legislative Council.

2nd. *Municipal Councils*, of which the majority are elected by occupiers rented at £7 a year, the rest being nominated by the Governor. In Colombo there are five official and nine elective members. The other two boroughs in the island are Kandy and Galle.

3rd. *Local Boards* in populous districts, composed in the same manner as the Municipalities. There are ten of these Local Boards in Ceylon. The qualification is an occupancy of not less than £3 10s.

4th. *The Village Council*.—This is a Council elected by a constituency composed of every male inhabitant of the village, or groups of villages, who is twenty-one years of age. There are forty-eight of these Village Councils. Anything approaching party politics is quite unknown in Ceylon. There is a tendency to jobbery, which, however, is kept in check by the official members. On the whole the system of local government appears admirably suited for the budding intelligence and education of the people, and will no doubt be extended as the social conditions improve and justify.

I have already spoken of wages paid on tea, coffee, cinchona, and other plantations, as ranging from 6d. to 9d. per day. The general rate of wages for labour in Colombo and other towns, for such work as stablemen, messengers, porters, gardeners, &c., is about the same, 12 to 15 rupees a month, the rupee being worth 1s. 5d. Men in more responsible positions, such as warehousemen, foremen of gangs of coolies, &c., are paid 35s. to 40s. per month. Skilled workmen, bookbinders, machinists, compositors, cabinet makers, and carpenters get 45s. to 50s. per month. Good clerks and bookkeepers, £40 to £50 a year. These wages will appear very meagre to an English workman,

but I expect the Cingalese is better off with these wages than the English workman with his. The Cingalese wants no fire, no meat, no woollen clothes, no beer; his house costs a tenth of the English workman's; he dresses in a shilling's worth of cotton cloth, and only wears a pennyworth of it when he is working. He is content with two meals a day of rice, at 5s. per bushel, and vegetables flavoured with curry, and has half a farthing's worth of dried fish on Sunday. He has never felt cold in his life, and the climate he lives in enables him to thrive as well on his simple vegetarian diet as an Englishman at home can on beef and mutton. Everywhere they give the constant impression of being a joyous, contented, sober, well-nourished people.

The Government of Ceylon, like that of every Crown colony, is virtually a despotism tempered by the Colonial office, and "question time" in the House of Commons. The Governor selects such men, in addition to his leading permanent officials, as he believes can best advise him, and the decisions of this Council become the will of the Government. The influence of a really able, energetic, independent Governor, thoroughly just and impartial, is practically paramount, and every successive Governor strives to leave behind him as the record of his term of office some public work of utility—an education scheme, a college, a hospital. A bronze statue of Sir Edward Barnes stands opposite the Queen's house in Colombo, but his real monuments are the great macadamized road to Kandy, the bridge of boats on the Kelani river at Colombo, and the superb satin-wood bridge at Peradenia. The railway to Kandy keeps green the memory of Sir Henry Ward; Sir Hercules Robinson has left his record in every province of the island, especially in irrigation works, and Sir William Gregory's massive stone monument is a mile long—the famous Colombo breakwater. The present Governor is set upon restoring to their ancient usefulness the great tanks at Kalaweava, which, when completed, will be seven miles square, 20 feet deep, and will send water down a canal 54 miles long, irrigating a vast area through the dry season; an area now almost unpeopled, but which 2,000 years ago, watered by these ancient tanks, had a population of at least a quarter of a million, whose ancient cities and temples, smothered in jungle, are still among the wonders of the East.

Plenty will be left for successive Governors to accomplish. A great development of the railway system is imperative, and its profitableness assured by past experience; the Lords of the Admiralty join the

Colombo Chamber of Commerce in the urgent demand for a good graving dock at Colombo, the only large dry dock in India being at Bombay; vernacular education is but in its infancy; the codification of the civil laws is unaccomplished; an agricultural college would aid greatly in the development of Crown and other lands; and nothing would add to the importance and wealth of Ceylon more than the abolition of its Custom House, and the establishment of Colombo and Galle as free ports.

This is a political programme well within the reach of the Government of Ceylon. Many of the public works named would be self-supporting from the first, and the rest might be carried out by loans. The public debt of the colony is not much more than a single year's revenue, and in recent years the splendid network of roads, the series of restored irrigation works and many public buildings, costing in all over six millions sterling, have all been paid for from the general revenue.

Among the social difficulties perplexing successive Governors is the question of the sale of alcoholic liquors, the consumption of which is undoubtedly on the increase, and to meet which temperance societies are being formed, and total abstinence is being urged on the natives. Missionaries, both European and native, are adding temperance advocacy to their Christian work, and most of them appear with a conspicuous blue ribbon. They find that "Christian" vices are the chief temptations to Christian converts, and one missionary whom I knew in England as a strong opponent of total abstinence has been forced by circumstances to adopt it, and is now making up by his zeal in the cause for his previous opposition. We cannot be held responsible, however, as in so many other heathen countries, for the introduction of intoxicating liquor into Ceylon. The inhabitants of Southern India manufactured them long before they ever beheld an Englishman, and have used toddy, the fermented sap of the cocoa-nut palm, for many centuries. The Portuguese and Dutch taught them to distil toddy into arrack, and we are now making them familiar with the infernal cheap spirit of Europe, which is sold in the village toddy shop to a considerable extent.

The licensing system of Ceylon is akin to that of India and Singapore. The exclusive privilege of manufacturing and selling arrack and toddy is reserved to Government, being farmed out by public auction every year in each province. These farmers in turn

sub-let the privilege to the village pot-house keeper, at a handsome profit, compelling the sub-tenant to buy all his supply from them, like the monopolist brewers in England. The head farmer usually manufactures for himself. He pays to Government 100 rupees for each still of a capacity of not less than 150 gallons. Wholesale dealers, who may not sell less than 35 gallons at once, also pay 100 rupees for a licence. Retailers arrange as best they can with the head farmer, who has paid a lump sum by auction. About one-seventh of the whole revenue is derivable from the arrack and toddy farming, which makes it very difficult for the Government to restrict its consumption without seriously disturbing the finances—a step from which every well-regulated Governor shrinks with dismay.

The liquor trade is virtually uncontrolled. No excise officers exist, and the Government has to depend upon the renters to detect and check illicit sales in their own districts. Adulteration is largely practised, and no efforts are made to prevent it.

It is very difficult to find any statistics by which it is possible to test absolutely the increase or decrease in the consumption of strong drink, but the rough test of the money the farmers are willing to pay for the monopoly gives a fair gauge. Here is an instructive little table which I have extracted from the Blue Book:—

Year.	Population.	Revenue.
1830.....	962,000 ..	283,000 Rupees.
1840.....	1,400,000 ..	410,000 „
1850.....	1,590,000 ..	557,000 „
1860.....	1,876,000 ..	735,000 „
1870.....	2,128,000 ..	1,279,000 „
Average for the last 10 years ..	2,650,000 ..	1,905,000 „

It will thus be seen that the farmers are willing to pay progressive prices for the monopoly, far in excess of the progressive increase in the population. A simple rule of three sum will show that the average for the last ten years gives nearly 900,000 rupees of revenue in excess of that of 1860, taking into account the increase in the population. The consumption of liquor by natives has therefore increased per head nearly double in twenty years, a fact that ought to cause the gravest alarm to any responsible Government. It must further be remembered that the last ten years has been one of very unusual depression, caused by the destruction of the coffee plant.

The consumption of spirits in Ceylon is estimated at twelve million bottles a year, which gives an average of four and a half bottles per

head, and a total expenditure of about eight millions of rupees. When it is remembered that apart from infants and young children, a large proportion of the population are Mohammedans, who are strict teetotalers, and that many others avoid intoxicants on grounds of religion or caste, it is not to be wondered at that this large consumption of spirits produces a great deal of drunkenness, enough to cause anxiety in the mind of every thoughtful Cingalese. A few years ago an administration report of one of the remote country districts said—“The habit of indulging in spirituous drinks increases. A glass of arrack has taken the place of a cup of coffee as the early morning beverage of many; others drink raw spirits immediately before their meals, while many, including not a few head men, have the reputation of being habitual drunkards.”

Native opinion is universally against the village arrack shop, and I have had abundant assurances that if the Government prohibited the distillation of arrack altogether, and only permitted spirits to be imported by the consumer, forbidding the retail sale, such restrictions would be warmly welcomed by all native society. It would without doubt be difficult to prohibit the use of toddy, which can be tapped from any hardy cocoa-nut palm. But compared with arrack, toddy is an innocent beverage, containing about four per cent. of alcohol, and is preferred by the natives perfectly fresh when it can be got, before fermentation has set in. The large amount of spirit drinking in Ceylon by the natives ought to alarm greatly the paternal Government of the island, and it should not be beyond the great ability of Sir Arthur Gordon to devise some fresh tax by which the revenue could be recouped. But loss of revenue from a diminished consumption of spirits would in itself result in a great saving of expenditure, as well as adding largely to the general prosperity of the population, and some serious effort ought to be made to check the evil, before its growing revenue increases indefinitely the difficulty of facing it. It is a scandal that a Christian Government of a heathen country should depend for its revenue on the vices and improvidence of its subjects.

The farming system, dependent as it is upon an unchecked stimulus to extended sale, is the very worst and silliest licensing method that could be devised. I was glad to find, in conversation with Sir Arthur Gordon, that he entirely condemned it, and is very anxious to exchange it for an excise duty, and a severely restricted system of

wholesale and retail licences controlled by the police and magistracy. I have no doubt that by this a larger revenue could be obtained from a smaller consumption, and that severe measures against adulteration might render the liquor sold less noxious. The really sensible course, however, would be to prohibit absolutely the sale and manufacture of distilled liquors, and face the disorganization of finance boldly; it would not be long before it would right itself by the increased prosperity, sobriety, and industry which would accrue. The problem is a difficult one, but I think that any Governor who solved it would go down to posterity with a greater name than any of his illustrious predecessors.

We left Colombo with much regret in the Peninsula and Oriental steamer *Rosetta* for Calcutta on the 15th of December. We reached Madras on the 18th. Madras is one of the oldest settlements in India, and is the third port in importance. It is a large town, with a frontage to the ocean of some three miles. A tremendous surf breaks on the beach, and the swell even in the finest weather renders it difficult to load and unload ships. Some years ago £600,000 or £700,000 was spent on two breakwaters, but they have been destroyed by successive gales, and the sea now flows fourteen feet deep over the greater portion of it. We were landed in huge boats, built of planks sewn together with cocoa-nut fibre, with twelve or fourteen oarsmen. It was difficult and dangerous to get in and out of these boats, as one had to jump into the arms of the crew, as she lurched up to the steps of the steamer, and afterwards to the pier. The Babel of tongues caused by thirty or forty of these boats round the ship was a perfect pandemonium. We spent a few hours ashore, wandering about the streets, but being Sunday, had no opportunity of visiting any of the institutions of the town."

Gonzales Ferdinandos Oviedus, who lived in Hispaniola (St Domingo) in 1515, and was governor of the city of Santa Maria, in Darien, in 1552, says, page 225, of his *Summary of the General History of the West Indies*:—"There is such abundance of sugar "in Mexico that certain Spanish ships are yearly freighted therewith, "and bring the same unto Seville in Spain, from whence it is carried "to all parts of Christendom."

As Mexico was not entirely conquered by the Spaniards until 1521, I think it is clear that the sugar cane must have been cultivated and sugar made in Mexico before the Spaniards went thither.—Dr. Mosley on Sugar, 1799, page 32.

NOTES ON SOME POINTS IN CONNECTION WITH THE
CHEMISTRY OF SUGAR.

BY H. W. WILEY.

In 1881, in a paper read before the American Association for the Advancement of Science, at Cincinnati, I described a sugar which appeared to have no effect upon polarized light and which for that reason I proposed to call anoptose. This sugar, in the light of our investigations at that time, appeared to be a natural product of the sugar cane and sorghum and not to have been produced by any process of manufacture. Further researches with sorghum seem to lend additional probability to this theory, as may be seen from the analyses described on pages 141, 142, and 143 of Bulletin No. 5 of the Chemical Division of the Department of Agriculture. It would be inferred from the optical inactivity of such a sugar that its presence would not interfere with the determination of cane sugar existing in the same solution. The mean analyses of 29 samples of sorghum juices recorded on page 141 of the bulletin mentioned above show the presence of 14.87 per cent. of sucrose by direct polarization and 14.90 per cent. by polarization after inversion. In these juices there was an average percentage of 1.32 reducing sugar, which, if it had been invert sugar, would have caused the first polarization to be considerably lower than the second. The practical identity of the two numbers obtained by the first and second polarizations show that the reducing sugar present had no appreciable effect upon the polarized ray. A similar set of analyses, on page 142 of the bulletin mentioned, shows 14.82 per cent. of sucrose by direct polarization and 14.83 per cent. by double polarization with the presence of 1.25 per cent. of reducing sugar. On page 143 of the same bulletin similar experiments show the presence of 14.53 per cent. by direct polarization and 14.72 per cent. by double polarization with 1.22 per cent. of reducing sugar present. In this set of analyses the reducing sugar appears to have been optically active. A fourth set of analyses, on page 144, shows 14.54 per cent. by direct polarization and 14.60 by double polarization, the content of reducing sugar amounting to 1.18 per cent. In three out of four cases, therefore, it is seen that the reducing sugar present has had no effect upon the polarization of the juices. Subsequent investigations have led me to modify somewhat the views originally expressed on this subject, since it is possible that a small percentage of dextrine (soluble starch) in the juice might neutralize the natural left-handed

polarization of the reducing sugar which would be present in case that reducing sugar is composed of levulose and dextrose in the proportions formed by the inversion of cane sugar. Since the action of the acid used for inversion would have little effect upon the dextrine in the short time in which it is in contact with the juices, it is seen that the almost identical numbers obtained by the two polarizations could have been secured by a condition of affairs similar to that noted above. At the time I made my communication to the Cincinnati meeting I had not seen Maumené's article on inactive sugar, published in the *Zeitschrift des Vereins für die Rübenzucker-Industrie des Deutschen Reichs*, in 1870, page 525. Maumené prepared this sugar, which he called inactose, in the following manner: Equal weights of sugar and pure nitrate of silver recently melted were dissolved in a small amount of water, 100 cc of water to 40 grams of the mixture. No lively action is at first observed, but in 24 hours the solution takes on a dark-brown colour, and if the solution is heated no gas is given off and only a part of the air in the flask escapes. The colour grows somewhat darker, but no appreciable precipitate is noticed. On filtering and evaporating in a water bath a colourless compound is obtained, which resembles phosphoric acid. If this mass is heated carefully over an open flame to 140° it remains unchanged. If the temperature is carried 2° or 3° above this the mass becomes opaque from the precipitation of a silver salt with the composition of AgO NO_3 with the evolution of vapour of water. The liquid is filtered two or three times in order to separate the very fine precipitate, and shows no notable rotation in the polariscope. The inactose is separated from the liquid by the addition of common salt, and the separation of the chloride of silver effected by filtration. Maumené further shows that the experiment succeeds better with sugar slightly alkaline, as beet sugar often is. If pure sugar is used .001 to .002 per cent. of soda or potash should be added. Maumené describes some further reactions of the inactose thus artificially prepared in the *Zeitschrift des Vereins für die Rübenzucker-Industrie des Deutschen Reichs* of 1888, page 57.

Winter has asserted in the same journal for August, 1888, page 780, that the reducing sugar naturally present in sugar cane contains no levulose. He concludes from his observations that—

1. In ripe sugar cane there is no levulose, and therefore no invert sugar.

2. That the blades of the cane contain no levulose.
3. That invert sugar is produced during the process of manufacture.

These views, however, seem to be contradictory to the results obtained by me in Louisiana during the season of 1887-88. I made a determination in 13 samples, using every possible precaution, of the sucrose present in the cane juices from healthy ripe canes, both by single and double polarizations. The amount of reducing sugar was very small, the average for the 13 samples being 0.5 per cent. The mean percentage of sucrose in the juice of the 13 samples was 14.49 per cent. by a direct polarization; by double polarization it was 14.67 per cent., an increase of 0.19 per cent. This would correspond almost exactly to the theoretical influence of the presence of 0.5 per cent. of invert sugar at the temperature at which the observation was made. While there is no doubt of the formation of a small amount of invert sugar during the process of manufacture, this is reduced to an almost inappreciable minimum when the best methods of manufacture are employed. In a careful study of the inversion produced by evaporating cane juice to a thick syrup in a Yaryan quadruple-effect apparatus the following facts were noted:—

Any inversion which would take place in the process of concentration would be indicated by an increase in the ratio of reducing sugar and sucrose.

In the entering juice the mean ratios are as follows, viz.:—

By direct polarization, 3.45 parts reducing sugar to 100 of sucrose.

By double polarization, 3.39 parts reducing sugar to 100 of sucrose.

For the issuing syrups the ratios are follows:—

By direct polarization, 3.57 parts reducing sugar to 100 of sucrose.

By double polarization, 3.51 parts reducing sugar to 100 of sucrose.

It will be seen by the above numbers that the inverting effect of the Yaryan pan is practically nothing. It amounts to only one-tenth of a pound to 100 pounds of sugar made or two pounds to the ton of sugar.

It will be seen, therefore, that the invert sugar present in the syrups and molasses of the sugar cane could only have been derived from the ripe cane.

A record of these analyses is found on pages 50-53 of Bulletin No. 18 of the Chemical Division of the Department of Agriculture. There is no doubt, therefore, that the reducing sugar present in the sugar cane juices examined contained levulose. If sorghum and cane juices

were composed alone of a solution of sucrose the quantity of this substance could be accurately determined at once by direct polarization. Whether or not the substance which I originally described as anoptose be present in such juices, it is quite certain that other substances optically active are present. In these juices the substances other than sucrose which tend to produce right-handed rotation at ordinary temperatures are soluble starch, so called, and its derivatives, dextrine and dextrose. Of the substances tending to produce left-handed rotation at ordinary temperatures may be mentioned levulose, contained in invert sugar, and certain nitro-genous substances. As a result of these disturbing influences the determinations of the sucrose present in cane juices, molasses, and syrups by a single polarization may be far from the truth. For instance, in the single and double polarizations of syrups corresponding to the samples of juice mentioned above from ripe Louisiana canes the direct polarization showed 43.60 per cent. of sucrose and the indirect 44.39 per cent. of sucrose (page 50, Bulletin No. 18). When it comes to molasses the difference is still more marked. In nine samples of molasses made from ripe Louisiana canes, as above mentioned, the single polarization showed 36.48 per cent. of sucrose, while the double polarization showed 44.77 per cent. (page 51, Bulletin No. 18). In four samples of molasses from W. J. Thompson, of Calumet Plantation, Pattersonville, Louisiana, presumably derived from ripe Louisiana canes, the mean percentage of sucrose by direct polarization was 16.88 per cent., and by indirect polarization 25.68 per cent.

The grotesque errors, therefore, which analysts may make by the examinations of such solutions for sugar by a single reading of the polariscope become at once apparent. When it is considered that the estimation of the percentage of sugar in molasses admitted into our country through the custom-house is determined solely by a single estimation by the polariscope, we see how great the frauds may be, and yet everything be conducted in strict conformity to law. A molasses testing 56° by the polariscope may contain nearly 70 per cent. of sugar, judged by the standards given above. In point of fact, such molasses contains much less than the numbers mentioned, but still a quantity larger than indicated by the direct polariscopic observation. The exact character of the reducing sugars appearing in healthy sorghum and sugar canes is not yet definitely known, and I hope soon to make further observations upon this subject.

MR. GLADSTONE ON FRUIT GROWING.

Mr. Gladstone has always and naturally taken a great interest in the Hawarden Horticultural Society, which has done a great service to the country in affording opportunities for the making of most interesting little speeches by the ex Prime Minister. One of the most remarkable deliverances on agricultural matters was made at its annual show. It was that in which Mr. Gladstone advocated the cultivation, to greater extent, of fruits for preserving purposes.* He was laughed at at the time by "those friends of the farmer," his political opponents, but the great increase in the jam trade which has taken place since fully confirms Mr. Gladstone in the views which he then gave expression to.

In the speech before the same Society on the 22nd ult., Mr. Gladstone again dwells upon the importance of fruit culture and jam making, and gives currency to the extraordinary statement "upon what appears to be good authority" that there were 60,000 people, that means 60,000 heads of families, probably representing a population of some hundreds of thousands in this country employed in the manufacture of jam. If we take the total number, including men, women, and children (the number of young girls employed is large) at 60,000, it will be found to be excessive.

The following is the portion of Mr. Gladstone's speech referring to fruit culture and jam making :—

FRUIT GROWING.

I wish to say something about fruit, because that is a very important industry, and an industry growing continually more and more important, as I will show you. In the year 1839 there were about 90,000 acres of fruit trees grown in this country. In the year 1872 they had grown to 172,000 acres, and they are now estimated, by a very able gentleman, whose works I have often quoted to you—Mr. Whitehead, who writes in the *Journal of the Royal Agricultural Society*—they are now estimated by Mr. Whitehead at 214,000 acres. Now, 214,000 acres is a very considerable acreage indeed, and I doubt whether that includes all the small gardens of the country. But some people began to be alarmed, and a gentleman of the name of Mott has published an article this year in what is called the *New*

* See the *Sugar Cane*, page 90, 1884, Vol. XVI.

Review, for the month of February, which is entitled "The Fruit-growing Folly." In this article he says some things which are no doubt sensible enough, but I do not believe that fruit-growing is a folly. What he says is that the farmers are too easily misled into it. I have heard many complaints of criticisms upon the British farmer, but I must say that among his faults I never heard that going in too rapidly for new things was conspicuous. I have heard him found fault with in other directions, but in my opinion he is quite competent to defend himself against any danger on that side, and I doubt very much whether there is any ground for this charge. However, that is one of the things that Mr. Mott says. He goes on, too, and attacks the cultivation of apples. What does he say about apples? Supposing you buy apples at about 8d. a pound. That is what he considers a reasonable price. The ordinary price you will judge much better than I can. I have never bought any. That is what he says is the ordinary price. He says—What are your apples? Five-sixths of them are water, and therefore he considers that your apples really costs five times eightpence—six times eightpence—that is to say 4s. the pound, which seems rather dear for apples. He complains that there are five-sixths of them water, and all the water, he thinks, is of no good at all, and ought not to be reckoned. Well, now, when I read this criticism of Mr. Mott's, I began to think is there nothing else besides apples that are made up of water, or considerably made of water. Perhaps it would not be civil or polite to ask one of you gentlemen have you got any water in the composition of your body? Therefore I will speak for myself, because it is perfectly well known by chemists and philosophers how much of the human body is water. The last time I was weighed I weighed fourteen stone—I beg your pardon, twelve stone. Fourteen pounds a stone, that comes to, I think, 168 pounds. Now I know very well from what I have read in books of authority, that out of that 168 pounds something like 120 is water, and that which happens to me, and I am of as solid stuff as other people, I believe you have the same proportion, and I believe that the gentleman who wrote these articles, Mr. Mott himself, is three-fourths of him probably water. Apples may have a little more water than we have; turnips have a little more than apples; but still they are very useful things, and I thought a good deal of the water which is in the apples might help to make up the water which is in the human body.

THE CONSUMPTION OF FRUIT.

But there is more than this. This gentleman says we have no power of increasing the consumption of fruit, except by giving it at a lower price. That opens a very curious subject. You must, he says, give it at a lower price, and thereby he infers that it won't be increased, because you do not want to sell it for less than you got for it now, and it is his doctrine that you can only have an increase in the consumption of fruit by selling it at a lower price. The demand otherwise, except for the rich people, which is a small portion, is a fixed demand, and you cannot extend it. This is an interesting question, and let us see how far there is any truth in it. Is it a fact that there is no power for increasing the demand for fruit in this country? I say there is a very great power of increasing it, and it is increasing continually, and I will give you a proof of the increase. In 1859 there were 71,000 bushels of apples imported into this country. In 1869 that had grown from 71,000 to 491,000; and in 1888 that had grown from 491,000 to 3,800,000 bushels of apples, of a value, if I remember rightly, of £800,000, or something of that kind. How has all that increase come about? Now, I observe that the increase has been almost all in foreign apples. You see that the importation has increased more than thirtyfold, but we have no such great increase in the growth of the domestic apples. Now, I want the Englishman to rouse his own spirit and compete freely with the foreigner where he can, and he can do a great deal in this matter. There is a great deal yet to be done, and it is true that sometimes you may find greater cheapness to the consumer accompanying a large extension of consumption. But there are other causes that operate too. The number who want luxuries and comforts—those who have the means of paying for them—is rapidly growing in this country. We still have poor and destitute people in this country, much as we regret it, and we trust they may be diminished, and we trust there will be no such thing as a destitute person in the country after a time; but, however that may be, there is no doubt at all of this, that not only those whom you call rich people, and very rich people, but the middle-class, and the class able to consume considerably in comforts and even luxuries, rapidly grows in this country, and will have more, and that is the reason that apples have increased from 71,000 to 3,800,000 bushels that are imported into the country. But pray remember that it is a plausible thing to say the consumption will not increase unless the price is

lowered. In the first place, it is not true, because it will increase if the consumer has better means. We have a great deal more meat consumed in this country now than 50 years ago, but the price is higher. How has the increase gone on with the increase of price? Why, because happily there are many more people able to buy meat and to eat it. But, besides that, it does not at all follow that because the consumer gets the article cheaper, the grower gets less for it. I will show you why. There are a multitude of things besides the price given to the grower which makes up the price in the market to the consumer. It is a long time very often before an article gets from the grower to the person who is to be the consumer. The grower sometimes has not got a good arrangement for the security of his capital; sometimes he does not know what other growers are doing; and associations such as this—which enable you to see what your neighbours are doing, and enable you to get a lesson from them—such associations do not exist in all parts of the country. Associations of growers are means by which better articles are produced at lower cost by the better economy of the means of production.

GRAFTING APPLES UPON PEAR TREES.

In the same way, journals which circulate knowledge upon these subjects are of immense utility. They tell people things that they did not know before, and enable them to grow things that they could not grow before. I am no practical authority, but I am going to quote a journal which is supposed to be a practical authority—the *Journal of Horticulture and Cottage Gardening*. It is a small thing I am going to quote, but it is interesting. In the *Journal of Horticulture* of October the 25th, 1888, I read a letter from a gentleman of the name of Kearn, and he says this—"I gave an account last year of grafting apples upon pear trees." You would say what is the use of that, but you will see what the use of it is. He says—"This year I have continued the experiments, and have grafted twenty-six scions of good apples upon such pear trees that were unfruitful or bore worthless pears. Twenty-one have taken strong shoots." Old age is a very awkward thing for men, as some of us begin to feel, and it is an awkward thing for pear trees. They are very apt to leave off bearing; but here is a curious fact, that when the pear tree has ceased to be fit to bear pears it is fit to bear apples; not without being helped—it must be helped by having the apples grafted into it—but it is a very curious thing that if its vigour has so far declined that it

cannot bring forth good pears it may bring forth good apples. If that is true I can only say it is a thing worth knowing. I dare say there are those among you who have got pear trees. We have in our garden pear trees which are not bearing pears, and if they can bear apples it is a very good thing. I only quote this as an example of the utility of circulating information upon these things.

THE ARRANGEMENT FOR DISTRIBUTING FRUIT.

Well, then there is another thing, and that is the arrangement for distributing fruits—the organisation of middlemen to bring the fruit from the grower, and to carry it to the market. That may be very good or very bad, and judging from what I read in this journal and elsewhere, there is yet a good deal to be done in that way for getting fruit economically and safely and well from the grower to the market in which it is to be sold and given to the consumer. There is another thing which appears not to have been so much studied in this country as in other countries—the picking and storing of it. A great deal of the fruit (and the same thing applies still more to flowers) is spoiled through bad and inefficient picking or sending to the market. All these things are things the nature of which is important, as the pursuit is more extensively followed, because when things are done upon a large scale it is more easy to do them methodically and well, and therefore progress in these things may be slight, but it may be very real notwithstanding, and I believe that for progress and for cheapness and better production in that way—that is to say, for selling in the market at lower prices without any loss to the grower, but, on the contrary, with gain to the grower—it is quite possible, and indeed very probable, that there is a great deal of room still remaining. I mention these particular heads in which there may be great economy still to be practised—economy in the means of bringing fruit to the market, and of great benefit to both parties, both to the grower and the consumer. Now, on this matter of apple-growing, I will endeavour to illustrate what I have said. And I will quote the testimony of Mr. Woodhead, whom I believe to be a good authority, whom I have quoted to you before, and whose testimony has never, that I know of, been confuted. Mr. Woodhead says that at this moment, from returns of prices made for apples in 1838, 1839, and 1840, on a large fruit farm in Kent—it is true that 1840 was a very abundant year—but it appears that the average price to the grower in 1838, 1839, and

1840 for the three years was 3s. 1½d. a bushel. That is what a grower got for them. Since then, as you see, there has been an immense increase of consumption. Does the grower get less now? No. According to Mr. Whitehead, in his article in the *Agricultural Journal*, called "Fifty Years of Fruit-farming," the average price of apples to the growers for the last three years is at least 5s. per bushel; so that you see there may be a state of things in which the consumer—for I do not believe apples to be dearer, but cheaper, to the consumer—in which the consumer gets the benefit and the grower also, because that means that machinery for transmitting the commodity from the grower to the community is much cheapened and improved. It is all very well to warn people against the fruit-growing folly. I will quote one more passage from Mr. Whitehead. He says that, upon the whole, taking an average of the last ten years, it is believed that fruit-growing has paid far better than any other agricultural industry during that period. There may be—and unhappily, many branches of agriculture have not paid well, and some have hardly paid at all—but there have been times, and we hope there will be good times—but I am speaking of the relative positions of these pursuits, and I am as far as anyone from wishing to see wild, rash, violent, and ill-conceived changes. Yet it does appear that there is every rational ground for extending this important industry. It is a most important industry, and let me point out that with flowers, for the most part they come and they are gone; but fruit has a double character. Fruit is a ripened commodity ready for consumption, as all the boys know, and some of the grown-up people.

JAM MANUFACTURE.

But besides that it is a raw material for manufactures. It is manufactured into jam and preserves of one kind and another, and perhaps you will be surprised—I was surprised when I found it to be stated upon what appears to be good authority—that there were 60,000 people, that means 60,000 heads of families, probably representing a population of some hundreds of thousands in this country, employed in the manufacture of jam. That manufacture is all employed upon fruit; for that manufacture there is a possibility of immense extension, and why? Because of the enormous advantage we have now enjoyed for some years in this country of the cheapest sugar in the world.

THE PRICE OF SUGAR AND THE SUGAR CONVENTION.

Do you know the change that has taken place in the price of sugar since I was young? You get for twopence now as much good sugar as you got for eightpence then. There has been no such revolution, I think, in the price of any commodity of life. One cause of the cheapening of the raw material is that, happily, we have been able to abolish altogether the Customs duty on sugar, and the consequence of that is that we have the best sugar market in the world, and have our sugar a great deal cheaper than the people of other countries. We are manufacturing the jam for them. Whenever you hear of the Sugar Duties Convention, and bounties upon sugar in foreign countries, I advise you to look very sharply into all plans and schemes which seek to go in the direction of making sugar dearer, because it will not only mean the narrowing of your comforts, but the restriction of your trade and the diminution of your employment. With such a commodity at your doors, you may say, for such fruit as will be grown in this country that there will be an appetite. There will be means enough of making it into preserves and jams, and the world at large will have plenty of appetite and plenty of means of consumption of all the jam that is made. Those are my views generally. I really believe that this is a very interesting and important subject.

SUGAR REFINING IN ENGLAND IN 1544.

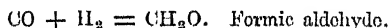
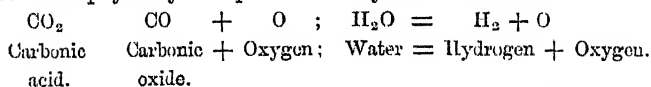
The art of refining sugar was first practised in England in 1544. The first adventurers in this business were Cornelius Bussine, Ferdinando Points, M. Mounsie, John Gardiner, and Sir William Chester; these persons were the proprietors of two sugar-houses, which were all at that time in England. The profits arising from this concern were at first but very inconsiderable as the sugar bakers at Antwerp supplied the London market at a cheaper rate than what English sugar bakers could. After the intercourse between England and Antwerp was stopped, these two sugar-houses supplied all England for the space of twenty years, and greatly enriched the proprietors. This success induced many others to embark in the same trade; a number of sugar-houses were established, and many persons failed and became bankrupts.—Dr. Moseloy on Sugar (1799), page 72.

THE PRODUCTION OF SUGAR.

BY WARD COLDRIDGE, B.A.

Yesterday the formation of sugar by plants was one of the mysteries of nature. Chemists and botanists, whilst they knew that ordinary chemical attractions must be the cause, were yet completely in the dark as to how these forces worked. They realised that plants started with carbonic acid and water, and from these products of animal existence built up in some unknown way the complex compound, sugar. From the deadly choke-damp to the luxury sugar was a great transformation. The plants could thus build; but men of science could not comprehend the process.

To-day, as the result of some brilliant researches, the explanation has been found. A simple compound, the formation of which by the plant can be readily accounted for, has been transformed into a sugar. To understand the process, it must be realised that abundant evidence proves that plants promote processes which are the opposites of combustion or oxidation. Plants liberate oxygen from its compounds, and absorb that with which it was previously combined. They can liberate oxygen from so stable a compound as carbonic acid, and in water find a source for the hydrogen which is essential to their development. The products which could thus be formed are, respectively, from carbonic acid, the lower oxide of carbon and oxygen, from water, the gases hydrogen and oxygen. Experiments have shown that under the influence of the silent electric discharge, and even without it, carbon monoxide and hydrogen combine to form a simple compound, formic aldehyde, which is immediately connected with the formic acid of the ant and of the stinging nettle. So the changes which occur in the plant under the combined influence of sunlight and chlorophyl may be represented in symbols as follows:—



This formic aldehyde was the substance experimented on. When it was suitably treated in the presence of the hydrate of lime ($\text{Ca}(\text{HO})_2$), it was induced to combine with itself and to form another compound. The latter is composed of the same ultimate indivisible particles (atoms) and in the same proportions; but they are now

differently arranged side by side, and with a larger number in the unit aggregation which chemists call molecules. This compound has now been finally proved to contain not one, but at least two or three members of the family of substances, carbohydrates, to which sugar belongs. Thus in our laboratories can now be imitated the process of which plants previously held the secret.

Whilst, however, the fact is marvellous that a sugar has been obtained artificially, it must be remembered that the process is absolutely uneconomical, for the yield is very small. This remark too applies to another process of artificial production. The sweet viscid liquid, glycerin, and its stinking, irritating offspring, acrolein, which gives the nasty smell of burning fat, have both been transformed into sugar, but the quantity obtained is very small in proportion to the glycerin or acrolein used. The importance of these researches lies in the fact that they show how the chemical changes which characterise the vital action of the plant can be imitated with dead matter, and that further they shed a bright gleam of light on the hitherto obscure question of the arrangement of the indivisible particles, atoms, within the compound particles, the molecules of these substances.

Our supply of sugar will always be drawn from the vegetable kingdom, the synthetic laboratory of nature. Many plants work hard and economically at the production of sugar, and form it in quantity. It occurs in all parts of plants—root, stem, leaves, flower, fruit, and seed. In some grasses it is very abundant, in the sugar cane, in the sorgho grass, and in the young shoots of the maize. In the common carrot and parsnip, and especially in the fleshy beet, large quantities are contained. But for its commercial extraction two sources are chiefly used—the sugar cane and the beetroot, and a third is of growing importance, the sorgho grass.

The sugar cane has far greater natural advantages than the beetroot. At one time the former held the field without a rival. But during the Napoleonic wars France was deprived of her supply of sugar, and she was driven to produce her sugar at home. This resulted in the commencement of the beet-sugar industry, and thus amongst the secondary results of war must be reckoned bounty-fed sugar. To judge of the economic aspects of the two industries, many factors have to be taken into account. When that has been done, the balance will be found distinctly in favour of the cane. Sugar canes contain sufficient sugar to yield 70 to 80 per cent. of their weight of

juice, in which there is some 20 per cent. of sugar. Beetroots, as an extended series of investigations have shown, possess a percentage of sugar varying from 7 to a maximum of under 14, and on the average about 11. Now an acre of land, which can be used for beet growing, will be rented for, say, £4 per annum, whilst in the Colonies an equal area of cane-producing land will be rented for about one-tenth of that amount. Further, a great divergence is found in the quantity of beet and cane which two equal areas can grow. For instance, in the environs of Magdeburg an acre will yield about 10 cwt. of sugar; whereas, in the home of the sugar cane, some 40—50 cwt. can be obtained. Then other items in the cost of production have to be considered; the difference in wages in the two regions, the difference in the cost of fuel—in Europe, where coal is necessary, in the Colonies, where the waste matter of the cane supplies the whole, or nearly the whole, of the fuel required. One can thus realise the grounds on which the Brazilian Commission on the sugar industry reported, that, in their opinion, “the cost of production may be reduced in Brazil to such a degree as to defy competition, and the struggle between cane and beetroot must become ominous to the latter, which thrives only by the artificial advantages which European countries have devised.”

Hitherto the artificial advantages have been on the side of the European countries; but now the greatly improved means of transit, and the diffusion of knowledge, are raising the colonists to a position nearer equality in these respects, of course excluding bounties. And by this time the colonial sugar-planter has learned a severe lesson. He understands that, whilst nature has showered her gifts on him with a lavish hand, she mercilessly punishes him for carelessness and lack of promptitude. For if he cuts his canes, they must within a few hours be crushed and extracted; if he is negligent, and leaves them for only two days, fermentation rapidly ensues under the conditions of tropical temperature, and the canes turn sour and must be thrown aside for fuel. In this way nature has fined men whole fortunes. Great fortunes have been made in the manufacture of sugar; but of these processes, with their special points of interest, an account must be reserved.

NOTES ON BOOKS.

FROUDACITY. West Indian fables by JAMES ANTHONY FROUDE, explained by J. J. Thomas, author of *The Creole Grammar*. 12mo. London: T. F. Unwin. 6/0. 1889.

This book is written in defence of the coloured population of the West Indies, by one of themselves, against the unfair and unjust attacks upon them by Mr. J. A. Froude in his "English in the West Indies."

"It may be possible," says Mr. Thomas, "that our new instructor in Colonial ethics and politics, under the impulsion of skin-superiority, and also of confidence in the probable success of experiments successfully tried fifty years before, does really believe in the sensibleness of separating *colours*, and representing the wearers of them as being generally antagonistic to one another in Her Majesty's West Indian Dominions. How is it then, we may be permitted to ask Mr. Froude, that no complaint of the sort formulated by him as against the Blacks has ever been put forward by the thousands of Englishmen, Scotchmen, Irishmen, and other Europeans who are permanent inhabitants, proprietors, and tax-payers of these Colonies?"

The author calls attention to the fact, that the present Chief-Justice of Barbados and the late Solicitor-General of Trinidad belong to the coloured race.

We think Mr. Thomas would have done well to have been content with what has already been published in answer to Mr. Froude, and in defence of his race. Mr. G. Salmon, in his "West Indian Confederation," mercilessly exposed Mr. Froude's fallacies and misstatements; since then we have Mr. Washington Eve's book on the West Indies, which, although no allusion is made in it to Mr. Froude, contains a good deal of information in complete refutation of Mr. Froude's opinions. Mr. Eves was for some years resident in Jamaica, and has an intimate knowledge of the habits and powers of the negro population; whereas Mr. Froude's information is, at best, of a very uncertain kind,—and was obtained, as he says, in this wise (page 73):—

"In Trinidad, as everywhere else, my own chief desire was to see the human inhabitants, to learn what they were doing, how they were living, and what they were thinking about, and *this could best be done by drives about the town and neighbourhood!*"

EMIGRATION FROM THE UNITED KINGDOM, FOR JULY, 1889 AND 1888, AND FROM JANUARY TO JULY, 1889 AND 1888.

Return of the numbers, nationalities, and destinations of the passengers that left the United Kingdom for places out of Europe during the month ended July 31st, 1889, and the seven months ended July 31st, 1889, compared with the corresponding periods of the previous year:—

MONTH ENDED JULY 31ST.

Nationalities.	United States.		British North America.		Australasia.		All other Places.		Total.	
	1889.	1888.	1889.	1888.	1889.	1888.	1889.	1888.	1889.	1888.
English.....	7,838	7,738	1,841	2,196	1,542	1,542	1,680	970	12,907	12,446
Scotch.....	1,286	1,557	437	312	261	261	96	119	2,080	2,197
Irish.....	3,031	3,942	183	261	276	239	27	17	3,517	4,459
Total of British origin.....	12,255	13,237	2,461	2,769	2,076	1,990	1,712	1,106	18,504	19,102
Foreigners.....	5,941	6,977	1,453	1,433	68	36	239	184	7,701	8,630
Nationality not distinguished.....	..	..	..	..	..	..	123	152	123	152
Total.....	18,196	20,214	3,914	4,202	2,144	2,026	2,074	1,442	26,328	27,884

SEVEN MONTHS ENDED JULY 31ST.

Nationalities.	United States.		British North America.		Australasia.		All other Places.		Total.	
	1889.	1888.	1889.	1888.	1889.	1888.	1889.	1888.	1889.	1888.
English.....	51,951	60,156	15,498	19,105	12,329	12,252	12,239	7,149	92,217	98,662
Scotch.....	10,929	15,249	2,982	2,159	1,766	1,766	1,766	311	16,143	23,012
Irish.....	41,883	47,794	1,402	2,026	1,317	2,081	1,767	274	46,069	62,176
Total of British origin.....	104,763	124,199	19,882	25,290	15,523	16,099	14,831	8,264	155,039	173,852
Foreigners.....	46,140	68,337	7,747	11,818	238	364	1,462	1,369	56,177	81,888
Nationality not distinguished.....	..	..	..	..	..	..	1,467	1,371	1,467	1,371
Total.....	150,903	192,536	27,629	37,108	15,821	16,463	17,820	11,004	212,173	257,111

Note.—The above figures, being made up at the earliest possible date after the close of each month, are subject to correction in the annual returns.

Commercial Department, Board of Trade, August 7th.

R. GIFFEN.

IMPORTS AND EXPORTS (UNITED KINGDOM) OF RAW
AND REFINED SUGARS.

JANUARY 1ST TO JULY 31ST, 1888-1889.

Board of Trade Returns.

IMPORTS.

RAW SUGARS.	QUANTITIES.		VALUE.	
	1888.	1889.	1888.	1889.
	Cwts.	Cwts.	£	£
Germany	2,553,721	3,474,153	1,672,228	2,155,828
Holland	191,829	316,122	124,520	262,183
Belgium	397,374	470,048	256,592	326,838
France	2,255	108,216	1,805	94,169
British West Indies & Guiana	1,644,973	1,362,394	1,311,533	1,289,278
British East Indies	835,626	1,138,692	401,523	785,020
China and Hong Kong ....	....	20,250	....	17,350
Mauritius	133,000	168,128	94,550	178,467
Spanish West India Islands	304,376	46,400	223,412	41,890
Brazil	2,005,459	695,792	1,261,494	497,686
Java	2,872,780	879,795	2,165,422	860,042
Philippine Islands	327,031	362,110	165,100	235,066
Peru	271,136	322,184	201,684	271,017
Other Countries	394,780	497,887	281,985	436,029
Total of Raw Sugars ..	11,934,430	9,862,171	8,161,848	8,230,863
Molasses	256,511	277,701	78,828	103,269
Total Sugar and Molasses	....	....	8,240,676	8,334,132
REFINED SUGARS.				
Germany	1,869,750	2,682,348	1,630,341	2,774,657
Holland	793,795	786,899	719,959	815,446
Belgium	120,257	154,435	114,718	165,140
France	483,742	1,003,848	440,908	1,092,058
United States	39,548	9,019	36,749	8,438
Other Countries	309,436*	597,964*	243,478	599,064
Total of Refined	3,616,528	5,234,513	3,186,143	5,454,803

EXPORTS.—REFINED SUGARS.

	Cwts.	Cwts.	£	£
Sweden and Norway	35,581	43,338	29,640	38,427
Denmark	46,319	62,028	33,933	50,895
Holland	48,727	52,195	35,938	43,483
Belgium	16,528	15,729	11,864	11,620
France	3,603	5,216	2,553	4,126
Portugal, Azores, & Madeira	46,527	34,692	34,324	28,910
Italy	54,614	49,961	40,420	43,810
Other Countries	98,188	76,715	78,516	69,647
Total of Exports	350,087	339,874	267,188	290,909

* Imported almost entirely from Russia.

IMPORTS OF FOREIGN REFINED SUGAR.

The British Sugar Refiners' Committee furnish us with the following figures, giving the imports of foreign refined sugar for the month of July, 1889, compared with the corresponding month of the two preceding years, and the average monthly imports for the year compared with those of 1886, 1887, and 1888, distinguishing the quantities of "Lumps and Loaves" from "other sorts," and giving the separate imports from each country:—

Countries from which Sugar has been imported.	"LUMPS AND LOAVES."						"OTHER SORTS," Including Crushed Leaf, Granulated, Crystallized, &c.						TOTAL.					
	Monthly Average.			July			Monthly Average.			July			Monthly Average.			July.		
	1886	1887	1888	1889	1887	1888	1886	1887	1888	1889	1887	1888	1886	1887	1888	1887	1888	1889
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
France...	1462	1363	1686	2040	1755	1777	2080	2688	3099	4855	5126	5509	4150	6462	6541	7264	3241	12608
Holland	3508	3750	3267	2590	4501	5134	1100	1428	2483	2675	3030	3131	4636	6263	5942	5620	8196	3995
Germany & Austria..	990	1347	1510	2928	1247	1772	2666	6634	10463	11729	16220	8820	7624	11810	13239	19158	14311	15763
Belgium	344	592	622	859	647	421	354	113	308	227	243	270	457	900	849	1102	917	603
United States	854	454	8	..	1339	54	..	5078	2804	167	61	2032	5932	3258	165	64	3371	506
Russia .....	..	3	..	39	..	..	20	3412	452	1939	3282	862	3412	455	1969	3321	862	2947
Other Countries .....	..	..	1	435	..	10	2702	9	15	2	518	..	9	15	3	953	..	5211
Total	7178	7539	7094	8891	9439	8968	8925	19362	21624	21604	28496	20627	26520	28163	28698	37387	30116	39824

SUGAR STATISTICS—GREAT BRITAIN.

TO AUGUST 24TH, 1889 AND 1888. IN THOUSANDS OF TONS, TO THE NEAREST THOUSAND.

	STOCKS.		DELIVERIES.		IMPORTS.	
	1889.	1888.	1889.	1888.	1889.	1888.
London	53	67	205	195	228	208
Liverpool ..	66	147	197	195	168	257
Bristol	2	4	37	33	37	33
Clyde	19	37	157	160	159	154
Total ..	140	255	596	583	592	652
	Decrease..115		Increase.. 13		Decrease.. 60	

SUGAR STATISTICS—UNITED STATES.

(From Willett and Hamlin's Circular.)

FOR THE FOUR PRINCIPAL PORTS. IN THOUSANDS OF TONS, TO THE NEAREST THOUSAND. FOR JULY, 1889 AND 1888.

	STOCKS.		DELIVERIES.		IMPORTS.	
	August 1st.		In July.		In July.	
	1889.	1888.	1889.	1888.	1889.	1888.
New York	42	96	64	84	81	61
Boston	4	10	12	17	13	8
Philadelphia....	4	5	33	21	35	21
Baltimore .....	..	..	..	..	..	..
Total.....	50	111	109	122	129	90
	Decrease.. 61		Decrease.. 13		Increase .. 39	
Total for the year			693	646	711	709

NEW YORK PRICES FOR SUGAR.

From Willett, Hamlen & Co.'s Report, August 15th, 1889.

FAIR REFINING.	96o/o CENTS.	GRAN- ULATED.	STAND. A.	STOCK IN FOUR PORTS.
Aug. 15, 1889.—6½c.	7 1-16c.	8½c.	8c.	Jan. 1, 1889— 32,254 tons.
Aug. 16, 1888.—5 5-16c.	6½c.	7½c.	7½c.	Jan. 1, 1888— 47,798 tons.
Aug. 18, 1887.—4 9-16c.	5 15-16c.	5½-15-16c.	5 9-16c.	Jan. 1, 1887—102,279 tons.
Aug. 19, 1886.—4 9-16c.	5 3-16c.	6 1-16c.	5 9-16-½c.	Jan. 1, 1886— 57,328 tons.
Aug. 20, 1885.—5½c.	6c.	6 11-16c.	6½-¾c.	Jan. 1, 1885— 89,186 tons.
Aug. 14, 1884.—4½c.	5 11-16c.	6 9-16c.	6 1-16c.	Jan. 1, 1884— 60,900 tons.
Aug. 16, 1883.—6½c.	7 9-16c.	8 11-16c.	8 3-16c.	Jan. 1, 1883— 50,297 tons.
Aug. 17, 1882.—7½c.	8c.	9½c.	8¾c.	Jan. 1, 1882— 43,927 tons.
Aug. 18, 1881.—7 11-16c.	8½c.	9½c.	9¼c.	Jan. 1, 1881— 66,999 tons.
Aug. 12, 1880.—7¾c.	8 17-32c.	10½c.	10½-¾c.	Jan. 1, 1880— 63,558 tons.

STOCKS OF SUGAR IN THE CHIEF MARKETS OF EUROPE ON THE
31ST JULY, FOR THREE YEARS, IN THOUSANDS
OF TONS, TO THE NEAREST THOUSAND.

Great Britain.	France.	Holland	German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1889.	TOTAL 1888.	TOTAL 1887.
140	120*	5	12*	34	15	326	534	490

*Estimate.

CONSUMPTION OF SUGAR IN EUROPE FOR THREE YEARS, ENDING
31ST JULY, IN THOUSANDS OF TONS, TO THE
NEAREST THOUSAND.

Great Britain.	France.	Holland	German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1889.	TOTAL 1888.	TOTAL 1887.
1307	484	40	431	249	351	2812	2698	2696

ESTIMATED CROP OF BEET ROOT SUGAR ON THE CONTINENT OF EUROPE
FOR THE PRESENT CAMPAIGN, COMPARED WITH THE ACTUAL CROP,
OF THE THREE PREVIOUS CAMPAIGNS.

(From Licht's Monthly Circular.)

	1889-90.	1888-89.	1887-88.	1886-87.
	Tons.	Tons.	Tons.	Tons.
France.....	505,000 ..	470,000 ..	392,824 ..	485,739
German Empire ..	1,030,000 ..	990,000	959,166 ..	1,012,968
Austro-Hungary..	630,000 ..	525,000 ..	428,616 ..	523,059
Russia and Poland.	500,000 ..	510,000 ..	441,342 ..	487,460
Belgium	145,000 ..	140,000 ..	140,742 ..	135,755
Holland	47,000 ..	45,000 ..	39,280 ..	36,098
Other Countries..	58,000 ..	55,000 ..	49,980 ..	49,127
Total....	2,915,000	2,735,000	2,451,950	2,730,206

As compared with Mr. Licht's figures for last month, his present Estimate shows a decrease of 25,000 tons; and as compared with his original Estimate, the decrease is 100,000 tons. Mr. Görz has just issued his first Estimate for 1889-90, viz., 2,788,000 tons; or 127,000 tons below Mr. Licht's latest reduced figures.

STATE AND PROSPECTS OF THE ENGLISH SUGAR MARKET.

The unsettled state of foreign markets, caused by recent speculations, has greatly affected this market, and prices of raw cane and refined sugar, during the past month, have fallen about 2s. 6d. per cwt., whilst the drop in beet 88%, since August 1st, is about 6s. per cwt.

Beet 88%, old crop, is quoted at 15s.; and new crop, November and December, 14s. 6d., which is within 6d. per cwt. of the price in March, when the advance commenced.

With stocks in this country and in the United States, some 175,000 tons below what they were a year ago, and in view of the probability that the German manufacturers will, where they can, hold back the new crop as much as possible, it is not likely that the present comparatively low prices can continue.

The imports of foreign refined, for July, amounted to 40,404 tons, against 29,824 tons in 1888, and for the seven months, 1889, the total is 261,708 tons, against 180,825 tons in 1888, or an increase of 80,883 tons.

The deliveries into the United Kingdom (four principal ports) up to 24th August, show an increase of 13,174 tons, as compared with 1888, and the imports a decrease of 59,465 tons.

The stocks in the United Kingdom on 24th August, 1889, were 140,041 tons, against 254,741 tons in 1888, a decrease of 114,700 tons.

Present quotations for the standard qualities, as under, are:—

FLOATING.		Last Month.
Porto Rico, fair to good Refining	17/3 to 18/6 against	20/- to 21/6.
Cuba Centrifugals, 97% polarization	18/6 to 19/-	„ 22/6 to 22/9.
Cuba, fair to good Refining	17/6 to 18/-	„ 20/6 to 21/-.
Java, No. 14 to 15 D.S.	19/- to 19/3	„ 23/6 to 24/-.
British West India, fair brown	18/-	„ 20/-
Bahia, low to middling brown	13/6 to 14/-	„ 16/- to 17/-.
„ Nos. 8 to 9	15/9 to 16/3	„ 18/3 to 19/-.
Pernams, regular to superior Americans..	15/- to 17/-	„ 17/- to 19/6.
LANDED.		Last Month.
Madras Cane Jaggery	12/6 to 13/- against	13/-
Manila Cebu and Ilo Ilo	12/- to 13/6	„ 13/0 to 14/-.
Paris Loaves, f.o.b.	22/6 to 22/9 against	25/-
Russian Crystal, c.i.f.	20/-	„ 23/9
Titlers	24/0	„ 26/6
Tate's Cubes	25/0	„ 26/6
Beetroot, German, 88%, f.o.b.	15/-	„ 21/- to 21/6.

THE SUGAR CANE.

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 The writers alone are responsible for their statements.

N.B.—All communications to be addressed, and Cheques and P.O. Orders made payable to HENRY THORP, 6, Ward's Buildings, Deansgate, Manchester.

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ERRATA.—In commenting in our last number (page 451) upon the returns of the German Joint Stock Sugar Companies for the campaign August, 1887, to July, 1888, and in giving the average price of beet, we gave, in error, the average price for 1888-89, instead of 1887-88; therefore for "for the first six months, 13s. 9d.," read 13s. 5d.; "for the first nine months, 14s. 8d.," read 13s. 7d.; "and for the whole year, 16s. 7d.," read 13s. 8d. When compared with these corrected figures, the results, as shown by the year's return (1887-8, see pages 466-471), are very remarkable.

The number of sugar factories at work in Germany in the campaign of 1889-90 is stated by the *Deutsche Zuckerindustrie* to be 400. Over half of them (210) are situated in Prussia, viz., Saxony, 126; Silesia, 58; Hanover, 44; West Prussia, 19, &c.; 32 are in Brunswick, 30 in Anhalt, 6 in Mecklenburg, 5 in Württemberg, 3 in Saxony Proper, 3 in Hesse, and only one each in Bavaria and Baden. Four factories are not working at present, and 4 new ones are being built.

The results of the last campaign (1888-1889) in Germany, as announced during the last four weeks, continue to be favourable. This was only to be expected in the case of such factories as were able to dispose of a good proportion of their production during the last advance; thus the Alt-Jauer factory, in which the yield was defective, and where a poor result had been anticipated up to the close of last year, shows after all a net profit of M. 265,460 on a share capital of M. 1,500,000. Still better results are, however, shown by some others. Only two show losses. The following are the details:—

DIVIDENDS DECLARED.

Wendessen (capital M. 367,500), 33½%, after placing M. 23,144 to reserve; *Alt-Jauer* (paid up capital M. 1,500,000), first dividend 5%, extra dividend 10%; *Münsterberg* (capital M. 600,000), 8%, after clearing off the previous year's loss of M. 68,670; *Graben*, 8%; *Culmsee* (capital M. 1,300,000), after writing off M. 164,730 and placing M. 48,595 to reserve, 6%; *Döbeln* (capital M. 690,000), 5%, after writing off M. 150,800; *Pelplin* (capital M. 600,000), 5% drawn from special reserve fund.

NET PROFITS SHOWN.

Fallersleben (capital M. 804,750), M. 264,917; *Badersleben* (capital M. 473,550), M. 262,132; *Wetterau* (capital M. 835,200), M. 158,568; *Malchin* (capital M. 600,000), M. 119,662; *Homburg* (capital M. 394,500), M. 96,411; *Zduny* (capital M. 900,000), M. 85,470; *Unislaw* (capital M. 429,600), M. 76,630; *Güstrow* (capital M. 831,500), M. 64,596, which goes to diminish the debit balance from former years of M. 270,240; *Obernjesa* (capital M. 750,000), M. 55,236; *Rastenburg* (capital M. 600,000) M. 54,325; *Nakel* (capital M. 699,600), M. 36,395; *Baddeckenstedt* (capital M. 379,800), M. 31,711; *Warburg* (capital M. 1,063,500), M. 22,250; *Etgersleben* (capital M. 219,600), M. 16,720, which goes to reduce last year's debit balance of M. 26,773; *Munzel-Holtensen* (capital M. 300,000), M. 7,181, which again goes to reduce former debit balance of M. 55,967; *Ummendorf* (capital M. 372,600), M. 5,041; *Sobbowitz* (capital M. 591,000), M. 3,026.

Austro-Hungary.—The Saaz factory declares a dividend of 7½%; it now possesses a reserve fund of fl. 100,000 (£8,330). Alluding to the contemplated erection of a new sugar factory in Hungary, the *Prester Lloyd* declares that the Government is not favourable to the establishment of any more works, as tending to overproduction.

Belgium.—The *Frameries-Noirchain* factory, with a capital of frs. 111,000, has made a profit of frs. 43,982.

LOSSES ANNOUNCED.

Tiegenhof (capital M. 492,600), has lost M. 75,582. The loss on the previous year's working was M. 11,123; *Schwetzwitz* (capital M. 790,400) has lost M. 22,808, which has to be added to last year's debit balance of M. 155,692.

A new sugar refinery is about to be erected in Baltimore, at a cost of £125,000, and it is expected that it will be ready for working in about twelve months.

Claus Spreckels' Refinery, in Philadelphia is, according to the New York *Handels Zeitung*, to be doubled in extent and capacity, so as to turn out 4,000,000 lbs. daily (in round numbers 1750 tons), Spreckels is also said to be about to erect two beet sugar refineries in California.

The New York German paper *Handels Zeitung* is responsible for the statement that Claus Spreckels has applied for a patent for an invention consisting of a method for rendering refined sugar so hard that it may be used in place of marble and other stone for building purposes. Spreckels is said to have come upon this discovery in the course of experiments made with a view of compressing into large blocks, so as to resist the weather, some sugar which he was sending to Mexico. The inventor asserts that he can produce, in any desired shape, sugar whiter and harder than the best marble, which, when used for building, will suffer as little damage from weather as granite, marble, and similar stone. To introduce his invention, Spreckels proposes to build an ornamental addition, consisting of hardened sugar, to the "White House," at Washington. To flatter the national pride of the Americans, the sugar to be used in the undertaking is to be extracted entirely from cane grown in the United States!

The same paper also says: An extraordinary rumour reached us yesterday from San Francisco, respecting the action of the Sugar Ring here, to the effect that the latter has commenced negotiations with an Anglo-German combination for the purpose of getting a control over the whole of the sugar markets of the world. The details of the plan are said to be as follows:—

The sugar plantations of Cuba, the Philippines, Java, and Mauritius are to be leased, by which means the principal sources of supply of raw sugar will be at the disposal of the ring or combination in question. The excess of unrefined beet sugar in Germany and France is to be warehoused for the present, and sent to the United States at the proper time, while the stocks of raw sugar are to be diminished by more than half. In this manner an artificial scarcity

of sugar would be created in Europe, whilst at the same time the American stock would be much diminished. To start this truly gigantic undertaking, a capital of 100,000,000 dollars would be required.

On the 17th ult., a fire broke out in the Bontin sugar refinery, at Bordeaux, which contained at the time 300 tons of sugar. The loss is estimated at £40,000.

Messrs. Dick & Meyer's sugar refinery in Brooklyn, N.Y., one of the "Trust," has been burned to the ground, all the efforts to save the premises from destruction having proved without avail. The loss, which is estimated at £400,000, is covered by insurance.

The *Zucker-Liquidationskasse* of Magdeburg has been founded, with a capital of M. 3,000,000, for the purpose of facilitating business in sugar for delivery by means of guarantees.

The International Sugar Bank is expected to be fully constituted in London by the end of September, and the shares will be issued in England, Germany, France, Belgium, and Holland in October.

The *Deutsche Zuckerindustrie* of the 20th September states that enquiries made at the saccharine manufactory of Fahlberg, List & Co., resulted in the information that during 1888 the total production of saccharine was 6,000 kilos., or about 17 kilos. (38½lbs.) per day. Assuming the sweetening power of saccharine to be three hundred times that of sugar, this could only take the place of 900 tons of sugar. This year, owing to additional machinery, &c., the production has reached 20 to 22 kilos. daily. The figures are accurate, as the factory is under government supervision. The firm assert that the supposed smuggling of saccharine into Belgium is a pure invention. The saccharine said to be on sale in Paris under the name of "sucre de Cologne" is declared to be as a rule starch-sugar (glucose).

A Commission has been appointed by Lord Gormanston, the Governor of British Guiana, to "consider in what way the banana and general fruit industry can best be encouraged."

The first sitting took place at Georgetown, on 13th August, Sir Charles Bruce, presiding. There were also present the Honourables J. N. Carrington, B. H. Jones, A. Barr; and Messrs. R. P. Drysdale, A. Weber, J. S. de Costa, R. F. A. Daly, F. Garnett, G. Ross, G. S. Jenman.

The chairman pointed out that the two most important considerations in connection with this enquiry were the *cost* and the *time* in conveying the fruit to market. As regards the ability of the colony to produce fruit in sufficient quantity, and at a right cost, these were questions which he did not suppose the commission need spend much time upon.

The fruit trade had done great things for Jamaica, but Jamaica has the great advantage of time in transit from port to port, being only half the distance to New York that Demerara is.

We have received from the Secretary of Agriculture, United States, Bulletin No. 21, containing a report of experiments in the manufacture of sugar by diffusion at Magnolia Station, Lawrence, Louisiana, 1888, prepared by Guildford L. Spencer, one of Dr. Wiley's assistants. Notwithstanding the difficulties encountered, more especially with the cane cutters, the amount of sugar produced on this plantation was 828 tons; the average being by diffusion 222lbs. of sugar to one ton of cane, against 168lbs. by the mill process, on the same plantation.

The following is a prefatory note, signed by Dr. Wiley, and addressed to the Hon. J. M. Rusk, the Secretary of Agriculture:—

“Sir,—In submitting for your inspection Mr. G. L. Spencer's report of work done at Magnolia plantation during 1888-89, I desire to call your attention to the advancement made in the last few years in the sugar industry of Louisiana.

In 1884 the Department established, in connection with the exposition at New Orleans, a complete sugar laboratory. At the same time the experimental diffusion battery, used by the Department in its work of the preceding year, was placed on exhibition.

During the same year the Department of Agriculture established at Magnolia Plantation, Lawrence, La., a complete chemical control of the sugar factory.

In December of the same year I delivered an address before the Sugar Planters' Association of Louisiana, in which the attention of sugar growers was called to the importance of chemical control and new methods.

In 1885 the Department made an attempt to introduce the process of diffusion into Louisiana on a manufacturing scale. By reason of a defective machinery, however, this attempt resulted in failure. In

1886, through the joint efforts of Mr. J. B. Wilkinson, the late Mr. E. J. Gray, and the Department of Agriculture, 150 tons of Louisiana cane were shipped to Kansas and worked by the process of diffusion, securing a yield fully 30 per cent. greater than the average milling process would have given. In 1887 the diffusion process was successfully introduced by the Department on Magnolia Plantation.

During the coming season the diffusion process will be used on four large plantations in Louisiana (Magnolia, Des Lignes, Berwick, Lagonda). Many other planters have also instituted a chemical control of the factory, and a sugar experiment station has been in successful operation at Kenner for four years.

The practical result of the work first undertaken in Louisiana by the Department of Agriculture is seen already in a more scientific agriculture, a better knowledge of the problem of sugar manufacture, a more scientific method in the sugar-house, and the introduction of recent and improved machinery. Before the time first mentioned the average yield of sugar per ton on the best plantations in the State was scarcely 145 pounds. It is now over 200 pounds.

Perhaps there has never been an instance in the history of the Department where its efforts have been so promptly manifested in such wonderful practical results. It is but just to the Department, in submitting the data herein contained, to call attention to the above facts in the history of the sugar industry of Louisiana. The progressive element among the sugar planters, aided by the scientific work of the sugar station at Kenner, has taken up the line of work first pointed out by the Department of Agriculture, and the result is a new era of prosperity, and a future of assured success for a great agricultural industry."

A telegram from New York says:—It would be interesting to know what influence induced the present governors of the Exchange to allow such an institution as the Sugar Trust, to enjoy all the advantages and privileges of regularly listed securities without undergoing any of the conditions and responsibilities of respectable shares. It is becoming clearer day by day that the promoters of the Sugar Trust should either be compelled to list the stock, and so make reliable the sworn statement the company's make up and condition, or else it should be at once thrown out of the Exchange.

The new German sugar legislation which came into force August 1st, 1888, levying a tax on consumption as well as on beets worked up, has proved a success, the net receipts of the Treasury having been nearly 39½ millions of marks, against not quite 24 millions of marks for the preceding year. The bonus obtained under the new legislation is, according to M. Doureau, 2frs. 55c. per sack of raw sugar, in place of 6frs. under the old *régime*, or not one half.

THE UNDEVELOPED RESOURCES OF THE BRITISH SUGAR COLONIES.

TO THE EDITOR OF THE "SUGAR CANE."

Dear Sir,—Fifty years ago British statesmen and capitalists would have treated with derision the prediction that in such a space of time England would become a large purchaser of continental beet sugars, yet to-day they are being produced in immense quantities, aided by bounties, to the detriment of colonial sugar producers. Sometimes nations pay high for buying temporarily in the cheapest market, and such may prove the case again if a far-sighted policy is not pursued.

Viewing the subject matter from a disinterested stand point, it strikes the observer as strange that the British consumer should risk receiving adequate supplies of cheap sugar from continental Europe when there is such a vast undeveloped territory in the empire capable of producing an abundance for the teeming millions. European complications, or a sudden and widespread disease in the beets, may at any time create such a rapid and prolonged advance in values that the difference in cost of the product to consumers will amount to a sum greater than would be required to furnish plants of the most approved type to fabricate from tropical cane every pound of sugar annually purchased by the nation.

What an immense field for British capital and enterprise! and all that is required to develop the industry is a clear and true comprehension of its present condition, the causes thereof, and the possibilities and certainties under different auspices.

It is futile to discuss the causes of the present depressed condition of the industry—ininitely better to regard the situation from a practical and technical point of view. Probably never in the history of the industry has there been such an opportunity for rapid advancement as at present, and no people in the world have such material at hand to render success doubly sure as the inhabitants of Great Britain and her colonies. The latter possess soil and climate and a portion of the requisite populace. The mother country has the capital, her sturdy farmers, sons skilled in husbandry, and mechanics of every description; her foundries and machine shops—peers of any in the world—where everything pertaining to sugar machinery can be made. Her magnificent merchant ships to transport every variety of apparatus, implements, rails for tramways, locomotives, chemical fertilizers, and

supplies of every known description for man and beast; and in the homeward voyage return loaded with sugar and other raw material from the tropics to be fabricated, thereby giving employment to thousands at home.

When we remember from what small beginnings the beet sugar industry has developed to its present gigantic proportions, and the many difficulties which have been surmounted, we are led to wonder at the supineness of Great Britain and the United States—the two greatest sugar consuming nations of the world—the former possessing immense areas of land in her dependencies capable of producing millions of tons of sugar, and the latter with such a wonderful diversity of soil and climate, that sugar from cane, sorghum, and beets can be produced at home for double her present population.

England with her 40 million souls, who consume 70lbs. per capita, and this country with 60 millions, whose consumption per capita is 52lbs., aggregate over 5,500,000,000lbs. of sugar—nine-tenths of which is obtained from other nationalities.

The hundreds of millions thus expended are a serious drain on the resources of each country, and the evil should be remedied by prompt and energetic measures.

The pertinent question will be asked, why has cane sugar production not kept pace with that from beets? One of the causes has, in a measure, been the want of capital,* but the main trouble has been the ignorance of the producers as to the richness of their canes, and a want of strength and rigidity in most of the mills to insure the maximum of extraction. Were the British manufacturers at home to waste as much raw material in any industry as results from present methods in most sugar houses, bankruptcy would result at no distant day. Such is the inevitable, if radical changes are not made, and consumers may ultimately pay extortionate prices to other nations for that which should be made virtually at home. The average yield the world over is less than 7 per cent. of sugar, yet over 10½ per cent. has been obtained in Louisiana, and over 14 per cent. in the Sandwich Islands by milling and maceration—the latter exceeding any results yet obtained by diffusion. The magnificent output of over 280lbs. of sugar per ton of cane at Waiokea is due to the skill of Mr. Alex. Young, of Honolulu (formerly Scotland), who has brought milling to such perfection that 80 per cent. extraction

* Rather, we should say, the want of security for the employment of capital.—ED. S.C.

was reached and maintained during the last campaign. Recognising the value of steel, power, not ponderosity, was sought and judiciously applied, and instead of using 42 to 48 inch rolls, the strength was put in the massive steel bolts, pinions, and gearing.

The three 30-inch rolls, with 12-inch journals, ground from 15 to 18 tons of cane per hour, giving about 70 per cent. extraction. The bagasse after saturation was automatically fed to the auxiliary rolls (same diameter) by what must be an admirable device, as the total juice extraction was 80 per cent., and the bagasse conveyed at once to the furnace, where the combustion was so perfect that the concentration of the entire juice with about 50 per cent. dilution was accomplished with super-heaters as adjuncts to the boilers.

A plant giving such astonishing results will not cost a farthing more than many where the extraction is not over 66 per cent., and the yield 150lbs. per ton of cane, if recourse is had to power properly applied, in conjunction with simplicity and continuous effectiveness in concentration to *masse-cuite*. The results are due to strict attention to details, such as must be had to ensure success. That the canes were rich in sucrose, the co-efficient of purity high (the unmaturred parts of the canes charged with glucose left in the field as should be done), and the inversion almost nil, is demonstrated by the fact that there were only $3\frac{1}{2}$ gallons of molasses per 1,000lbs. of sugar.

How can cane sugar producers compete with beet growers? Space will not admit of an elaborate discussion of a subject replete with ramifications, yet it can be elucidated readily to those conversant with what tonnage can be had per acre in canes, and the yield of sugar which can be had per ton. It must be remembered that the area in Europe adapted to sugar beet culture is somewhat limited, and the cost price of those lands (from \$140 to over \$400 per acre) as compared to colonial soils is immense. It is an established fact that with canes the maximum yields per acre (20,000lbs.) are not realised where the pounds per ton are greatest, for in the latter case the juice has a Beaumé of from 10° to 12°, whereas in the former it ranges from 7° to 8°, the cause of which is, the growth is so excessive that the rays of the sun are greatly excluded, and the formation of saccharine is thereby retarded. To demonstrate what can be done on sugar estates, it is only necessary to cite that Mr. Thompson, of Calumet, in this State, obtained by the old process from 80lbs. to less than 100lbs. of sugar per ton of cane, and last year, with the juice inferior in sucrose

to that at Waiakea, averaged 206lbs., and when the canes were exceptionally good for the season reached 225lbs. per ton, and no fourths were made.

The profit of the planters of old, since the reign of low prices, has gone to vinegar, inversion, the slop ditch, and mainly to the furnace.

Were the field work as thorough and the extraction as perfect, the yield per acre from tropical canes would double that of beets.

The average loss or waste in juice has been enough to make over 50lbs. of sugar from every ton of cane ground, and the tonnage per acre not over one half what it should have been—due to inferior field manipulations, want of intelligent fertilising, and the baneful reliance on old and comparatively worthless ratoons.

The advocates of diffusion may ask, why not adopt that process whereby all the sugar can be obtained, and dispense with milling, which is liable to serious breakdowns?

First demonstrate that thereby all the sugar from 85 per cent. extraction is obtained in a good marketable condition, and that superior milling can be dispensed with, and then we will strive to answer the question, for we know full well it requires better milling to press the water of imbibition from spent cane fibre than the juice from the canes.

When diffusion is perfected then will be the time to add to the establishment where from 80 to 82 per cent. is being had, a plant whereby 85 per cent. will be guaranteed—if it is deemed advisable to incur such a heavy outlay for so small a margin of profit.

To insure success, raze many of the old sugar houses to their foundations, sell the machinery as old iron, and on the sites, if suitable, erect plain, powerful, effective apparatus, and cover as inexpensively as possible to insure protection from rain and storms. One such establishment, conducted on purely business principles will soon display an output such as to convince the most sceptical of the financial results to be realised from intelligent cane culture and sugar production. Circumstances, location, and the amount of canes to be manipulated must govern details. The subject, from its national and industrial bearing, is worthy of the consideration of the statesmen and capitalists of Great Britain.

T. MANN CAGE.

Terre Bonne, Louisiana, U.S.A., Sept. 11th, 1889.

INTERNATIONAL SUGAR STATISTICAL INFORMATION.

(From the *Sucrierie Belge*)

The idea of supplying international statistics with regard to sugar is steadily gaining ground. The statistical bureaux in Germany and Belgium having been organised, we now see a third country, Bohemia, making a move in the same direction. We have just been informed that the Union of Sugar Manufacturers of Bohemia has decided on the establishment of a statistical bureau, under the management of Mr. Horinek, one of the editors of the *Prager Zuckermarkt*.

The Bohemian sugar manufacturers are divided into 22 groups, each comprising from four to nine sugar works. A reporter has been appointed for each group. No doubt the organisation will soon extend over the whole of Austria-Hungary. The international agreement already existing between the statistical bureaux of Germany and Belgium will from now be extended to include that of Bohemia. The Belgian manufacturers will thus receive full information from Germany and Bohemia, at the same time as the manufacturers of those countries, and at least five days before publication. This organisation will, we hope, soon be completed by the adoption of the system by France and Russia.

The Syndicate of the French sugar manufacturers has already commenced by establishing a statistical bureau. We understand that they will shortly consider the question of an understanding with the bureaux of other countries. The Syndicate of the Russian manufacturers is still more advanced. The organisation of its bureau not only covers the 187 factories which belong to it, but all the factories in Russia. An enquiry is being made by the administration independently of that of the Syndicate.

It seems needless to insist on the importance of such an international organisation, of course on condition that everyone understands the necessity of the information given being absolutely accurate.

The fanciful figures given by Mr. Licht and other statisticians, more or less interested, which have so often influenced the sugar quotations, to the injury of all genuine manufacturers, will now give place to real figures. And the manufacturers will be able to occupy themselves exclusively with their own industry, so useful to the country, in place of anxiously watching the manoeuvres of speculators. International sugar statistics will constitute an important step in this direction.

It will then only remain, in default of any similar organisation for the countries beyond seas, to establish an information service, more dependable than what we have at the present time, for the production of cane sugar. And this will be done, no longer for the profit of a few idle speculators, but for the benefit of every hard working manufacturer.

MR. GÖRZ ON THE PRESENT SUGAR STATISTICS.

Mr. Joseph Görz, of Berlin, basing his conclusions on the reports received, estimates the sugar production of Europe, as follows:—

	1889-90. Tons.		1888-89. Tons.
Germany.....	1,020,000	...	970,000
Austria-Hungary	620,000	....	512,000
France.....	510,000	....	460,000
Belgium	105,000	....	96,000
Russia	450,000	....	485,000
Holland ..	40,000	....	35,000
Denmark.....	20,000	..	19,000
Spain	18,000	....	15,000
	<u>2,783,000 *</u>		<u>2,592,000</u>

He says that the estimates of August, have for the last two years been 2·7% to 3% in excess, and consequently we shall do well this year not to accept the figures given without taking into account a similar possibility, supposing that the changes in the state of the crop do not differ materially from those of the two preceding years. The figures given for the Belgian production only deal with the quantity which pays duty, the real production is difficult to estimate and is greater than that given.

He considers that the future production of Europe will not suffice to meet both the extraordinary deficit in stocks, and the growing requirements of consumption. It will depend on the result of the next crop of cane sugar whether the situation of the general market shall or shall not become similar to that of the present year. As regards the colonial crop, we consider it is yet too early to make any exact estimate, all we can ascertain is that in the greater part of the colonies we may reckon on an increased production, owing to the development of the cultivation and the favourable temperature.

* For Mr. Licht's *bear* estimate see page 559.

THE STOCKS OF SUGAR IN GERMANY.

From the *Prager Zuckermarkt*.

According to official figures the stocks of sugar in Germany amounted, on the 1st of August, to 77,000 tons (calculated to raw sugar value) against 105,000 tons at the same period in 1888, and 102,000 tons in 1887. The movements of sugar in Germany for the last three campaigns were as follows :—

	1888-1889. Tons.		1887-1888. Tons.		1886-1887. Tons.
Stocks, 1st August	105,000	..	102,000	..	164,300
Production	978,500	..	959,100	..	1,023,700
Imports	4,000	..	7,200	..	4,700
Supply	1,087,500	.	1,068,300	..	1,192,700
Exports	612,200	.	514,700	..	661,100
Stocks, 1st August	77,600	..	105,000	..	102,000
Consumption	397,700		448,600		429,600

Messrs. Görz & Herbertz, whose figures for Germany we have adopted, calculate the monthly stocks of sugar by dividing the yearly consumption by 12, and regularly deducting the sum thus obtained. In so doing, they assumed that the consumption of 1888-89, as compared with that of the two preceeding years, would amount to 400,000 tons, and so they would have to deduct, every month, 38,300 tons for the consumption. In this manner they have gone on reckoning the stocks up to the 1st July of the current year, and, calculating in this manner, the stock in Germany would, at the beginning of August, have amounted to scarcely 15,000 tons. But, as the table given above shows, the consumption in Germany has decreased very considerably, viz.: by 60,000 tons. For this reason the stocks, as derived from official sources, appear much greater than was previously calculated.

We are exceedingly surprised, especially when we consider the extreme importance of these statistics of the German stocks, that neither the sugar manufacturers nor the merchants should take steps to obtain perfectly accurate figures with regard to these stocks. Nothing would be more easy than to be able to calculate the sugar stocks, even to a centner, as is done in Austria.

ON SYNDICATES.

IN CONNECTION WITH THE LATE CRISIS AT MAGDEBURG.

The *Magdeburger Zeitung* has some pertinent remarks on syndicates in general, which seem particularly appropriate at the present juncture. We, therefore, translate them in extenso. "Combinations for the object of raising the price of any article of universal consumption by means of enormous purchases have, as experience shows, constantly failed, and entailed severe losses on their promoters. In spite of this we see that every now and then a lot of foolhardy speculators turn up, who think they can disregard these lessons with impunity. This happens more especially when a flush of commercial prosperity has produced great activity in the various exchanges, and accumulated large and rapidly acquired funds in the hands of the Bourse operators. The extent of the present high tide of prosperity, which has already emptied over us in Germany a whole cornucopia of share companies, may be judged of, to a certain extent, by the fact that the miserable collapse of the Paris Copper Ring a short time back, which gave us an opportunity of uttering some words of serious warning, did not prevent the formation of the Magdeburg combination for forcing up the price of sugar, and that both in the old and new worlds several similar attempts have been ventured on. Artificial inflation of prices, when the object of such attempts is an article of universal consumption, is undoubtedly far more injurious than in cases where the endeavour is to advance the value of some special stock or scrip. In the former case the sudden fluctuations in price thus produced become a source of widespread injury, both to the consumer and to the general trade; whilst in the latter the artificial influencing of the stock exchange quotations can only operate injuriously within a comparatively restricted circle. The further objection made to the first-mentioned kind of combination, that prices are rendered dearer to the consumer, is scarcely valid from a practical point of view, because such artificially caused advances are precisely those which we find by experience are of short duration, and the upward movement is, as a rule, compensated by a heavy decline. That which consumers have for a time paid extra, in consequence of the forced advance, they later on get back to the full when the almost inevitable re-action sets in. We say 'to the full,' because the decline in values which follows the collapse of

the upward movement is usually much in excess of the advance which had preceded. This is only partially accounted for by the want of confidence disturbing the course of business, which is usually widely spread by the collapse of such operations for a rise, the principal cause is rather to be looked for in the fact that the increase in values caused by the movement naturally produces an increase in production, and at the same time a diminution of consumption, which intensify the subsequent depression of the market price. This course of things was clearly observable in the copper trade, when it underwent an unnatural development through the action of the Paris Copper Ring.

As regards the sugar industry, a similar effect can only be said to have been produced in so far that the increase of production, which we have in prospect, may be partially regarded as a consequence of the inflation of prices. At the present moment, we have no indication whatever of any inundation of the market by surplus production of sugar, on the contrary, the statistical position of the article is exceedingly sound, and the total amount of the sugar stocks comparatively insignificant. That in spite of this, the prices of sugar have succumbed to the large quantity offering and fallen so low, must be ascribed to the peculiar state of matters on the exchanges. We are, at present, just in the midst of the consequences of the re-action, which succeeded the forced inflation. So long as the stores of sugars in the hands of houses financially weak remain undisposed of, the relation of stocks to consumption cannot have its proper effect on the movement of prices.

The present depressed state of the sugar prices no more reflects the statistical position of the article than did the fall in the rouble quotations, which a short time ago followed the collapse of the Schwieger speculation, predicate the position of the Russian commercial balances. It is true that there is no lack, especially among the smaller merchants, of those who cast doubt on the calculations made by experts of the relation of stocks to consumption, and look on these as confuted by the existing low quotations for sugar. Such assertions, based entirely on general impressions, cannot however detract from the value of practical statistical figures.

But the circumstances that, in spite of a statistical position undeniably favourable to an upward movement of prices, the combination for artificial inflation has collapsed, appears strikingly adapted to place in a clear light the dangers accompanying the formation of such

“Rings.” We believe that the bitter but wholesome lesson afforded by the failure of the Magdeburg Ring will long remain an enduring one, in spite of the existing high tide of commercial prosperity.

It is scarcely to be wondered at that, in face of the great excitement caused by the reckless speculations of the three Magdeburg sugar houses, we should hear the desire expressed in some quarters for the adoption of legislative measures, tending to prevent similar occurrences. Fortunately, we may have sufficient confidence in the commercial instinct of the leading parties interested, to believe that they will treat such demands of the movement with the consideration, or rather with the neglect which they deserve. Irregular proceedings of this nature can hardly be got at in the way of legislation. Penal clauses enacted with this view would not be difficult of evasion, and would further sensibly interfere injuriously with the general course of business.

SACCHARINE AGAIN.

(Letter to the Etoile Belge.)

It might have been foreseen that the duty of 120 francs per kilo. which the Chambers have put upon saccharine would be a regular premium granted to fraud.

I know from a good source that waggons of hay sent from Germany to Antwerp contain large quantities of saccharine, skilfully disposed throughout the load. I have endeavoured to obtain official information respecting this colossal fraud, but the Customs officials maintain the greatest reserve, and it would seem as if the central administration had given instructions to that effect. However, they do not deny the fact, they simply say nothing. I am informed that they have at last seized one of these waggons, and that an action is to be brought against the consignee. We shall therefore soon know how matters stand.

As 100 kilos. of saccharine could easily be hidden in a waggon containing 10,000 kilos. of hay, and there are reasons for believing that 30 of these waggons had been sent before the Customs house officers got scent of the fraud, you can imagine on what a scale it has been carried on. The smugglers may very well have gained 30,000 francs, at the expense of the Treasury, in very little time.—Antwerp, 24th August, 1889.

BARBADOS.

FIFTY-ONE SUGAR PLANTATIONS IN CHANCERY.

The following list of sugar plantations, of the aggregate extent of 9053 acres, and which are valued at £313,638 18s. 6d., are set down for sale at the Chancery Chambers, Bridgetown, and is taken from the *Barbados Globe* of August 15th.

No person having bid for the following sugar work plantations on the respective days on which they were set up, the same will again be set up for sale at the Chancery Chambers, Public Buildings, Bridgetown, on every succeeding Friday, between the hours of 12 and 2 o'clock p.m., until the same are sold :—

Smith Exx., Pltff. ; Barker Exor., Dfdt.

1. "ROWANS" Plantation, situated in the parish of St. George, containing 165 acres of land, appraised to the sum of . . . £10,509.

Evelyn, Plaintiff ; Evelyn, Defendant.

2. DAYRELLS Plantation, situate in the parish of St. Michael, containing 66 acres of land, appraised to the sum of . . . £5,305.

Gibbs and al., Pltff. ; Licorish Exor., Dfdt.

3. FARBS Plantation, situated in the parish of St. Peter, containing 55 acres of land, appraised to the sum of . . . £2,416.

Boxill, Pltff. ; Gill and al., Dfdts.

4. MORGAN LEWIS Plantation, situate in the parish of St. Andrew, containing 354 acres of land, appraised to the sum of . . . £10,125.

Agard, Pltff. ; Williams, Dfdt.

5. THE RISK Plantation, situated in the parishes of St. Lucy and St. Peter, containing 89 acres of land, appraised to the sum of £2,313.

Musson, Pltff. ; Reece, Dfdt.

6. PILGRIM PLACE Plantation, situate in the parish of Christ Church, containing 277 acres of land, appraised to the sum of £13,758.

7. EGERTON Plantation, situated in the parishes of St. George and Christ Church, containing 163 acres of land, appraised to the sum of . . . £11,651.

Henry, Pltff. ; Haynes, Dfdt.

8. AIRY COT Plantation, situated in the parishes of St. Andrew and St. Thomas, containing 30 acres 3 roods and 18 perches of land, appraised to the sum of . . . £1,800.

McClean, Pltff. ; Drayton, Dfdt.

9. CHIMBORAZO Plantation, situated in the parish of St. Joseph, containing 69 acres of land, appraised to the sum of . . . £4,808.

DaCosta and al., Pltffs. ; Kirton, Dfdt.

10. HAYNES HILL Plantation, situated in the parish of St. John, containing 121 acres of land, appraised to the sum of . . . £8,295.

Mason and al. Trustees, Pltff. ; Bovell, Dfdt.

11. ELLERTON Plantation, situated in the parish of St. George, containing 109 acres of land, appraised to the sum of . . . £5,076.

Haynes and al. Trustees, Pltffs. ; Gill and al., Dfdts.

12. PARKS Plantation, situated in the parish of St. Joseph, containing 262 acres of land, appraised to the sum of . . . £6,716.

Richards, Pltff. ; Sanderson, Dfdt.

13. PLEASANT HALL Plantation, situated in the parish of St. Peter, containing 168 acres of land, appraised to the sum of . . . £6,716.

Kirton, Pltff. ; *versus* Kirton, Dfdt.

14. EAST LYNNE Plantation, situated in the parish of St. George, containing 29 acres 13 perches of land or thereabouts, appraised to the sum of . . . £2,000.

Brathwaite, per next friend, Pltff. ; *versus* Brathwaite, Ex.

and al., Dfdt.

15. "TRINITY VIEW" situated in the parish of St. Philip, containing 8 acres 1 rood 18 perches, appraised to . . . £418.

16. BAMBOO LAND, situated in the said parish, containing 2 acres, appraised to . . . £100.

Kirton, Pltff. ; *versus* Kirton, Dfdt.

17. HOPELAND Plantation, situated in the parish of St. Philip, containing 10 acres of land, appraised to . . . £611 10s.

The Barbados Mutual Life Assurance Society, Pltffs. ;

Clinckett, Official Assignee, Dfdt.

18. LITTLE DIAMOND Plantation, situated in the parish of St. Philip, containing 19 acres of land, appraised to the sum of . . £1,067.

Bovell, Pltff. ; Bovell, Dfdt.

19. "FREERE PILGRIM" Plantation, situated in the parish of Christ Church, containing 220 acres of land, appraised to the sum of £15,608 2s.

Handy and ux., Pltffs. ; Gill and al., Dfdts.

20. "STERLING" Plantation, situated in the parish of St. Philip, containing 219 acres of land, appraised to the sum of . . . £8,590.

Boxill, Pltff. ; Rock, Dfdt.

21. "NEWBURY" Place, situated in the parish of St. Philip, containing 38 acres and 1 rood of land, appraised to the sum of .. £835.

Walcott and al., Pltffs. ; Ashby, Dfdt.

22. "THE SPRING" Plantation (inclusive of Water Hall, York, and Clintons), situated in the parishes of St. James and St. Andrew, containing 532 acres of land, appraised to the sum of .. £21,341.

Healis and al., Pltffs. ; Jones, Dfdt.

23. "GRÆME HALL" Plantation (inclusive of South View), situated in the parish of Christ Church, containing 276 acres of land appraised to the sum of .. £14,539.

Packer, Pltff. ; Farnum, Dfdt.

24. "THE HOPE" Plantation, situated in the parish of St. James, containing 40 acres of land, appraised to the sum of .. £1,921.

Ashby, Pltff. ; Bascom, Dfdt.

25. "REDLAND" Plantation (inclusive of Sweet Vale), situated in parishes of St. Joseph and St. George, containing 202 acres of land, appraised to the sum of .. £10,958.

Simpson, Pltff. ; Kirton, Dfdt.

26. "THURBAN" Plantation, situated in the parish of St. Philip, containing 61 acres of land, appraised to the sum of .. £3,634.

Birch, Admr., Pltff. ; Greaves, Dfdt.

27. "BRIGGS BAY" Plantation, situated in the parish of St. James, containing 148 acres 19 perches of land, appraised to the sum of £5,333 10s.

Chambers and al., Pltffs. ; Skeete, Dfdt.

28. "LOWLAND" Plantation (inclusive of Shepherds and Griffiths), situated in the parish of St. Lucy, containing 195 acres of land, appraised to the sum of .. £5,458.

Howell trus., Pltff. ; Louis and al., Dfdts.

29. "THE IVY" Plantation (comprising Prospect, Rouen, Radcot, Millingtons, and O'Neal's), situated in the parish of St. Michael, containing 66 acres 1 rood 37 perches of land, or thereabouts, appraised to the sum of .. £4,481 3s. 3d.

Grant and al., Pltffs. ; Spencer, Dfdt.

30. "THE PINE" Plantation, situated in the parish of St. Michael, containing 463 acres 2 roods and 36 perches of land, or thereabouts, appraised to the sum of .. £17,249.

Cottle, Pltff.; Challenor, Dfdt.

31. "MIDDLETON" Plantation, situated in the parish of St. George, containing 43 acres of land, or thereabouts, appraised to the sum of £1,687.

32. "THE HILL" or "SCOTIA" Plantation, situated in the parish of St. Peter, containing 150 acres of land, or thereabouts, appraised to the sum of £3,678.

Musson, Pltff.; Alleyne, Dfdt.

33. "MULLINEUX" Plantation, situated in the parish of St. James, containing 255 acres 1 rood 11 perches of land, or thereabouts, appraised to the sum of £12,630.

Hutson, Pltff.; Drayton, Dfdt.

34. "WOODBOURNE" Plantation, situated in the parish of Christ Church, containing 171 acres 3 roods and 21 perches of land, or thereabouts, appraised to the sum of £7,087.

Gibbs and al., Pltffs.; Went, Dfdt.

35. "THORPE COTTAGE" Plantation, situated in the parish of St. George, containing 134 acres of land, or thereabouts, appraised to the sum of £4,806 12s.

Browne, Pltff.; Browne, Dfdt.

36. "THE GROVE" Plantation, situated in the parish of St. Philip, containing 245 acres and 2 roods of land, or thereabouts, appraised to the sum of £13,544.

37. "CONGO ROAD" Plantation, situated in the parish of St. Philip, containing 281 acres and 1 rood of land, or thereabouts, appraised to the sum of £13,774.

38. "SANDY HILL" Plantation, situate in the parish of St. Philip, containing 185 acres and 2 roods of land, or thereabouts, appraised to the sum of £8,717.

Bascom, Pltff.; Connell, Dfdt.

39. "HALTON" Plantation, situated in the parish of St. John, containing 309 acres and 6 perches of land, or thereabouts, appraised to the sum of £17,410.

Taylor, Pltff.; Seale, Dfdt.

40. "THORPES" Plantation, situated in the parish of St. James, containing 87 acres and 2 roods of land, or thereabouts, appraised to the sum of £3,541.

Smith and al., Pltffs.; Phillips and al. exor. and trus., Dfdts.

41. "DURANTS" Plantation, situated in the parish of Christ

Church, containing 206 acres 1 rood and 16 perches of land, or thereabouts, appraised to the sum of £6,791.

B. M. L. A. Society, Pltffs. ; Field and al. exor. and trus., Dfdts.

42. "THE RETREAT" Plantation, situated in the parish of St. Joseph, containing 111 acres 1 rood and 26 perches of land, or thereabouts, appraised to the sum of £6,385 0s. 3d.

Kellman, Pltff. ; Kellman, Dfdt.

43. CHANCE HALL Plantation, situated in the parish of St. Lucy, containing 263 acres 1 rood and 11 perches of land, or thereabouts, appraised to the sum of £11,052.

Harris, Pltff. ; Harris, Dfdt.

44. "JEZREEL" Plantation, situated in the parish of St. Philip, containing 48 acres of land, or thereabouts, appraised to the sum of £2,540.

Grant and al., Pltffs. ; Spencer, Dfdt.

45. "THE VINEYARD" Plantation (inclusive of the place called Shepherd's Cot), situated in the parish of St. Philip, containing 283 acres of land, or thereabouts, appraised to the sum of . . . £13,910.

Shepherd and al. trus., Pltffs. ; Shepherd and al., Dfdts.

46. "KIRTON" Plantation (inclusive of the places called Race's, Gitten's, and Harrison's), situated in the parish of St. Philip, containing 415 acres 2 roods and 21 perches of land, or thereabouts, appraised to the sum of £16,387.

Grant, Pltffs. ; Grant, Dfdts.

47. "SENIORS" Plantation, situated in the parishes of St. Joseph and St. Andrew, containing 170 acres of land, or thereabouts, appraised to the sum of £3,296.

Best, Pltff. ; Harvey, Dfdt.

48. "GREENLAND" Plantation, situated in the parish of St. Andrew, containing 409½ acres of land, or thereabouts, appraised to the sum of £10,333.

Sealy, Pltff. ; Sealy, Dfdt.

49. "SALTRAM" Plantation (inclusive of "The Union," "Binfield," and a piece of land containing 3 acres 2 rood 26 perches), situated in the parish of St. Joseph, containing 159 acres of land, or thereabouts, appraised to the sum of £8,514.

Hendy, Pltff. ; Springer, Dfdt.

50. "SWANS" Plantation, situated in the parish of St. Andrew, containing 152 acres of land, or thereabouts, appraised to the sum of £5,109.

Carrington and al., ttees., Pltffs. ; Burgess, Dfdt.

51. "HAGGATTS" Plantation, situated in the parish of St. Andrew, containing 549 acres and 1 rood of land, or thereabouts, appraised to the sum of £8,844.

W. K. CHANDLER, Master-in-Chancery.

ON THE MANUFACTURE OF "YELLOW CRYSTALS" IN DEMERARA.

BY GEORG BARTSCH (Szymborze).

Communicated to the *Deutsche Zuckerindustrie*.

The competition with cane sugar, and especially Demerara crystals, which the grocers' sugar manufactured from the beet has to contend with in the English market, seems to make it advisable for me to give a short report on the processes used in manufacturing the former.

The Demerara crystals are distinguished by their splendid yellow colour, known as "golden bloom," their remarkably fine taste, and the size and well-defined shape of the crystal. This kind of sugar being in so great favour in the English market, the price is consequently rather high, and the entire aim in the manufacture is to satisfy the taste of the consumer, even though, from a technical point of view, there is a loss in the production.

I shall attempt a short description of the manufacture, and, for the sake of simplicity, will choose a plantation in British Guiana, which turns out 2,400 cwts. per week, making a total of 1,920 tons for four months' working. I may just add that the production of this plantation is acknowledged to be among the best in Guiana, and obtains the highest prices in London.

The operations may most advantageously be divided into crushing, sulphuring, heating and liming, defecation and clarification, boiling, and treatment of the molasses.

CRUSHING.

The cane, which in Guiana is brought to the mill by punts (iron canoes) and in Trinidad by two-wheeled carts or on rails, goes first to the feeding-frame which is outside the building. Here the Indian workmen arrange the cane stalks into layers of regular thickness, chop the larger canes in two with a cutlass, and throw out rotten or sour canes and pieces of root. Great care is taken that the canes shall be fed to the mill in layers of equal thickness, so that the crushing may be regular and satisfactory. The construction of these mills is well known, but I may remark that the hydraulic arrangement of the pressure of one of the rollers works very well, and that the crushing is thereby rendered more independent of the workmen.

The expressed juice varies in colour from dark to light brown, is from 17° to 21° Brix, contains from 13 to 18 per cent. of sugar, 0.70

to 2·30 per cent. of glucose, and its quotient of purity is from 76 to 85 calculated to cane sugar. At the same time it possesses a strong acid reaction; the amount of acid contained in 100 ccm. of juice answering to 0·80 to 2·40 ccm. of $\frac{1}{10}$ N. soda lye. The acids are partly mineral and partly organic, phosphoric acid constituting the greater part of the mineral acids. I have generally found that the greater the proportion of acid the greater the amount of glucose, and the smaller the amount of glucose the higher the proportion of cane sugar, and the better the quotient of purity.

The quotient of purity of the juice, as regards cane sugar plus glucose, varies between 88% and 96%. Albumen is not present in the same proportion as in beet juice; there is only a slight precipitate on heating, and the same may be remarked in all the various stages of the manufacture.

The conditions of fermentation being favourable in the tropics, the juice easily ferments, all the more quickly in proportion as the quotient is poorer and the juice more acid at the outset. If the juice is too acid, it is less adapted for making good sugar, and is better employed for rum. The juice is also rendered very impure by the presence of fine fibres and portions of cane which have passed through the rollers. The latter are raked out of the receiver which is placed below the rollers, and for separating the fine fibres the juice has to pass through one or more fine meshed copper strainers. The crushed canes, called bagasse or megass, are carried by an elevator to the boilers to be consumed in the seven-tubed boilers along with coal or wood. Before being burned it is weighed, and the result being added to the weight of juice gives the quantity of canes worked up.

SULPHURING.

The juice, cleared of the fibres, runs into a small receiver, and is raised to the sulphuring vat by means of a pulsometer. The vat in which the operation is effected is constructed of wood; planks are arranged internally in such a manner that the juice falls down in the form of a cascade, while the sulphuring gas flows up to meet it in the contrary direction. A blow-out pipe is attached to the covering of the vat to remove the surplus sulphurous acid. The juice flows out below in a considerably altered condition; it is much lighter in colour, and the lighter it is the better will be the colour of the sugar. The acidity is considerably greater, and the glucose also increased by 0·30 to 0·40 per cent.

EXAMPLE (average of 20 analyses).

	Brix.	Sugar.	Glucose.	Quotient.
Before the sulphur vat ..	18.3	14.73	2.05	80.4
After ,, ,, ..	18.0	14.43	2.32	80.2

The quantity of sulphur employed is from 1,000 to 1,100 lbs. per 2,400 cwts. of sugar of the first jet.

From the sulphuring vat the juice has again to pass through a strainer, and is then driven to the heater by a pump attached to the mill.

LIMING AND CLARIFICATION.

In the clarifying process the principal thing is to obtain a precipitate which will rapidly settle. The vats which are employed for this purpose are iron vessels, with a slanting bottom, furnished with a vent pipe for the sediment, and a so-called "floating cock" for drawing off the clear juice. The clarification is the most important of all the processes, and on it depends the ultimate success of the processes.

According to the *Overseers' Manual*, the juice must be limed to the extent that neutral litmus paper shows a slight acid re-action. Any excess of lime has the immediate effect of darkening the colour of the juice, the more acid it is, the better the colour.

By the old method, which is being more and more abandoned, the clarification was conducted with juice that was only slightly acid or almost neutral, and the favourite colour peculiar to the more acid juice was produced afterwards in vacuo.

As the juice contains a large quantity of phosphoric acid and this in combining with lime produces a heavy precipitate, they are now working here with phosphoric acid, *i.e.*, phosphate of lime.

The juice, heated to 200° or 220° F. in the heater, is mixed with lime water of 10° to 15° Bé., in the proportion of 100lbs. of juice to 0.14 lbs. of lime. At the same time, a solution of acid phosphate of lime is kept in readiness, and as soon as the lime is thoroughly incorporated, the phosphoric acid solution is added, and the whole carefully mixed. About 0.06 lbs. of acid and phosphate of lime are used to 100 lbs. of juice. The phosphoric acid preparation in use here is very inferior, containing gypsum, silicate of lime, and a quantity of organic matter, and is, therefore, more suitable for manure, for which it is also used, than for purifying. In spite of this, the clarification is good and rapid, though there is no proper chemical effect. The quotient of cane sugar in the juice is lowered by the phosphate solution, which is further assisted by a slight formation of invert sugar at the expense of the cane sugar.

The reducing sugar is increased by 0.20 to 0.30 per cent., and the acidity of the juice is also increased, though not in any great degree, as some organic acids disappear. After standing from half to three quarters of an hour, the flocculent matter has fallen to the bottom, and the clear juice is drawn off by the floating cock as far as the top of the sediment. It is warm, of a light yellow colour with a greenish tinge, and on cooling becomes dark brown and opaque. The sediment, called "scum," is of a slimy nature, somewhat like boiled spinach, and consists for the most part of water, sugar, glucose, much cellulose, coagulated albumen, gypsum, silicate and phosphate of lime. The greater part of the lime, as has been found by numerous calculations, passes off in solution, and later on causes much trouble in the after products. The scum is run off into vats, and conducted thence to the Taylor filters. The juice which comes from the filters, added to the clarified juice already drawn off, is taken to the "eliminators," the scum residue, which contains from 14 to 17% of sugar, is carried to the fields for manure. The proportion of scum to cane is 1.5 to 1.9% by weight.

If the acid phosphate of lime is added to the juice from the crusher before it has passed through the heater, the clarification obtained is excellent, and not much invert sugar is produced; only the quantity of acid used must not exceed the organic acid, that is, the acidity of the raw juice.

As it is well known that alkaline cane juice has a higher quotient than acid juice, I tried the following method of working with success, even in the case of perfectly sour rotten cane. I had sufficient lime put to the heated juice from the mill to produce an alkaline reaction; adding phosphate until it tested 0.30 acidity with $\frac{1}{10}$ N. soda lye, per 100 ccm. juice. It did not answer to go below 0.10 ccm. $\frac{1}{10}$ N. soda lye, and there was nothing gained by exceeding this quantity. The juice drawn off was a fine brilliant colour, the formation of invert sugar reduced to a minimum, and the quotient of sugar only slightly lowered.

EXAMPLE OF A WEEK'S AVERAGE.

	Percentage acidity $\frac{1}{10}$ ccm.				
	Brix.	Sugar.	Glucose.	Soda lye.	Quotient.
Mill juice . . .	18.9	.. 14.78	.. 1.75	.. 1.47	.. 78.2
Clarified juice..	19.2	.. 14.91	.. 1.80	.. 0.30	.. 77.6

The following example will show that alkaline juice possesses a higher quotient than acid :—

	Brix.	Sugar.	Glucose.	Quotient.
Cane juice from the mill....	19·4	.. 15·73	.. 1·36	.. 81·0
Alkaline with lime	20·0	. 16·64	. 1·22	.. 83·2

A second clarification resulted in the juice undergoing a better mechanical purification. It is also not advisable first to heat the juice and then add the sulphurous acid before clarifying, nor to add the lime in the mill before the juice is heated, as is still done on so many plantations.

Whilst by the method here described the “scum” is not obtained by means of a press (because of the small quantity of lime contained), this mode succeeds admirably in alkaline working, as is done in Trinidad in the manufacture of grey sugar.

SECOND CLARIFICATION.—ELIMINATORS.

As already intimated, the cleared defecated juice goes to the eliminators for a second clarification. These consist of strong flat iron pans about $6\frac{1}{2}$ feet square, and $2\frac{1}{2}$ feet deep, to the top of which is attached an overflow gutter about 20in. wide, and the same depth. At the bottom of the pan and also at the bottom of the gutter is a discharge pipe fitted with a stop-cock. The pan is provided with a double row of heating coils, and the juice is now violently boiled in this pan. The dirt which comes up with the scum is skimmed off with a scraper into the overflow gutter, and afterwards again passed through the Taylor’s filter, whilst the clear juice runs into the reservoir for the evaporator.

If the clarified juice is still too dark in colour, which is mostly the case, then a small portion of acid phosphate of lime is added, and the whole is boiled. The end of the process is indicated by the already mentioned fine light yellow colour, which appears as soon as the rising scum becomes perfectly white.

The eliminators produce invert sugar, and candy is also formed. The increase in the reducing sugar amounts to from 0·30 to 0·50 per cent., calculated on the density of the original mill juice; and at the same time the quotient is lowered, by the taking up of phosphate and by inversion, from 77·6 to 75 per cent. The acidity rises from 0·30 cem. $\frac{1}{10}$ N. soda lye to 1·50 cem. in 100 cm. of juice. We may consider the actual effect of this apparatus to be the evaporation of 3% of the water contained in the juice, which is somewhat expensive with direct application of steam and without vacuum.

The clarification of the juices ceases with its passage through the eliminator, though one can hardly consider it clarified in the true sense of the word. An experiment made by me showed that not even all the mechanical impurities were removed. A Taylor's filter bag was attached to the outflow-pipe of the juice receiver, through which the juice had to pass before reaching the evaporator. In half an hour the filter bag would no longer act, a large quantity of fine cellular tissue or fibre having collected in it. These fine fibres were exposed to the air, and within two hours were in full fermentation. Experiment showed conclusively that juice which had been cleared of this fibrous matter took a much longer time to ferment than that in which it was present.

EVAPORATING AND BOILING.

The clarified juice runs by its own weight into the steaming apparatus, which is composed of three vessels. Formerly it was thought that that the fine colour of the sugar could only be obtained by boiling in a "copperwall," so that it almost seems as if the candy-ing had some small share in the colour. At present the triple-effect Yaryan apparatus is universally used here, and the "copperwall" is left to the Muscovado factories. The evaporators are not very well constructed, and mostly work with wet force-pumps, as on the plantation here spoken of. The syrup, usually with a density of 45 to 50° Brix, has undergone a further lowering of the quotient through the boiling; the amount of invert sugar has remained about the same, while the colour has become very dark. Only in the case of good cane does the syrup show a similar colour to beet syrup. It has a considerable scum, and has somewhat the taste of honey, in consequence of the amount of reducing sugar which it contains.

A pump conveys the liquor continuously to the syrup vat, whence it is sucked up by the vacuum pans, of which this plantation possesses three. They have a comparatively large heating surface, low elevation, wet force pumps and condensers with plate injection. It is considered as a necessary condition for obtaining a good product of the first jet, that the boiling should be quickly effected, as long boiling is believed to produce a bad colour. The crystallisation takes place rapidly, on the whole the juice boils comparatively easily. The evaporation is tested by the string test; in the crystallisation a sample is taken with the finger and thumb, so as to judge of the layer of syrup which is found between the crystals. Afterwards the

sample is taken with a glass, and the thumbnail test is used, for "striking."

Before striking, the colouring is completed by the addition of "bloomer," *i.e.*, chloride of tin. Some plantations use sulphuric acid, but most now employ the "bloomer." If too much is used, the masse-cuite and the sugar become reddish, which means a lower price for the latter; too little gives a greyish look, in short, practice only will teach what is the proper quantity, as no scientific datum can be given. In proper boiling, the temperature must never exceed 155° F., with a 26 in. vacuum, and at the commencement, the boiling must not be too much pushed, so that bold and fine crystals may be produced. As soon as the boiling has fairly begun, the temperature is raised to 160° F., and the striking point is regulated by the thumb test.

The sugar is emptied into movable vats, holding about 3 tons each. The masse is short grained, and is only viscid in case of very bad sour canes, or those which have borne no "arrows," and the colour is similar to that of our beetroot masse-cuite. The saccharine content varies between 67 and 74 per cent. of cane sugar and 7.5 to 14.40° of glucose, the quotient is low, the ash comparatively small, but higher than in the case of the grey sugar masse-cuite.

It is taken while still warm out of the vats, and centrifugalled with the least possible addition of water, as if the process lasts too long the sugar assumes a bad appearance. The centrifugals used almost everywhere are Weston's patent, driven from above, and emptied from beneath. The centrifugalling is not difficult, and is continued until no syrup shows on a chip of wood held between the strainer and the jacket of the centrifugal. If the colour of the massecuite is rather dark, it is clarified with a small quantity of water. The sugar is emptied into flat wooden vats, all dirt and lumps carefully removed, and packed either in sacks or in barrels lined with paper. Unusually fine parcels are packed in small sacks, holding about 50 lbs.

The first syrup is diluted with water, and lime added until the mixture shows an alkaline reaction, this is then gently boiled in special vacuum pans and run into crystallising vats. In about 14 days the crystallisation is complete, and the masse is centrifugalled. The second sugar is light coloured and fine in the grain, and contains from 86 to 88° of cane sugar; it passes, like the first product, into consumption without further purification. If the price obtainable for

after products is sufficiently high, the second syrup is again boiled, with a fresh addition of lime, if necessary. After standing for four to six months, the sugar obtained is exactly similar to the second product. The syrup No. 3 is used for distilling; it may be remarked here that the rum thus obtained is not equal to that produced on the muscovado plantations.

Instead of boiling the first syrup with lime I have used soda with good effect. The crystallisation in this case was more energetic and copious, but it was necessary to separate the large quantity of precipitate which was produced by the soda, which caused considerable difficulty.

As regards the yield of sugar obtained from a given weight of cane, no very accurate data can be given for Demerara, as in the whole of Guiana there is no plantation, not even the "Nonpareil," on which the cane is weighed before crushing. The yield in sugar is quoted per acre of land. On the estate of which I am speaking the weight of the cane was got at by weighing the bagasse obtained and adding the weight of the juice, which, for evident reasons, will not give perfectly accurate results.

A good mill gives in juice from 60 to 64 per cent. of the weight of the cane. With a saccharine content of 14·09 per cent., 6·70 per cent. of the cane weight is obtained in sugar of the first jet. From the masse-cuite about 55 to 64 per cent. is obtained by centrifugalling.

The yield in sugar of the second jet amounts to from 1·10 to 1·40 per cent., and of the third jet to from 0·15 to 0·20 per cent. of the cane weight.

The following is a short description of the mode of working adopted on another plantation in Trinidad:—

The juice from the mill is heated and then gassed, which is not so successful as when the sulphurous acid is applied cold. It then goes to the boiling vats, where it is boiled with lime; the mixture, after the boiling is completed, runs into settling tubs. The scum, which is quickly deposited, is passed through small filter presses, the resulting juice being added to the other, and both passed through the triple effect. The syrup is boiled with "bloomer" to produce the colour, the masse-cuite comes in two large flat masses and is at once centrifugalled. The sugar thus obtained is clean and well defined, but has

not such a fine colour as that obtained where phosphoric acid is employed in the defecation.

On another estate on the same island, whose sugars are noted for their excellence, the process is as follows :—

To 750 gallons of juice, previously raised to a high temperature, and slightly sulphured ($\frac{1}{4}$ lb.), 30 pints of milk of lime, (17° Bé.) are added. The thoroughly cleared juice is evaporated in open pans, the scum passed through presses. The syrup is boiled with “bloomer,” the masse-cuite centrifugalled warm. The sugar is coarse grained, has a fine colour, and fetches a high price. One ton of first jet requires $\frac{1}{2}$ ton of compressed fuel for the four boilers together with the usual bagass.

As regards the profits, these are never calculated, as with us, at per cwt. of cane. In making the calculation, the total of the expenses is simply deducted and the remainder treated as net profit, without anything being put to reserve fund.

If we come to reckon the net profit per cwt. of cane, this is, on many estates, nil; while on most of them it cannot exceed $\frac{3}{4}$ d. to $1\frac{1}{4}$ d.; a few prosperous factories may make as much as 3d. net profit per cwt. of cane, but such cases are rare.

FRENCH SUGAR PRODUCTION SINCE 1881.

The official figures relating to the French sugar production in 1888-89 (campaign closed 31st August) have just appeared.

The number of factories at work was 380, against 375 in the preceding campaign. The quantity of beets worked up was 4,216,850 tons, against 3,614,632 tons in 1887-88.

The production, expressed in refined sugar, was 414,870 tons, against 347,786 tons in the preceding campaign. This gives a yield of 9·83% in the refined sugar, against 9·62% in 1887-88. The excédants which escaped duty represent 26·19% of the total production, against 27·24% in 1887-88, and 36·44% in 1886-87.

The following table, given by the *Journal des Fabricants de Sucre*, shows the production of the last eight years, calculated to refined sugar :—

	No. of Factories.	Production. Tons.	Yield.
1881-82.....	486	335,575	6·10
1882-83.....	496	362,737	5·03
1883-84.....	483	406,007	5·55
1884-85.....	449	272,962	5·99
1885-86.....	413	265,084	7·83
1886-87.....	391	434,043	8·86
1887-88.....	375	347,785	9·62
1888-89.....	380	414,869	9·83

ON PAPER MADE FROM BAGASSE.*

A paper read before the Mauritius Chamber of Agriculture, by
M. VILLERS HART.

In the *Voleur Mauricien* of March 10th, 1889, we read the following article, which also appeared in the *Revue du Foyer*, of Lyons, on the 26th January, 1889:—

“It has long been known that the stalk of the sugar cane can be employed in the manufacture of paper of the best quality, and we are astonished that with the present over-production of sugar, which is tending constantly to lower the price of the article, and the steadily increasing consumption of paper, no one should have yet thought of starting this industry, which would enable sugar planters to get a larger profit out of their production.

The fibres of the sugar cane supply a paper of superior quality, and both the mechanical and chemical operations of the manufacture are very simple. In fact, the sugar remaining in the stalks contributes materially to the removal of the silicates. It is known that a sweetened alkali is preferable to the common alkali ordinarily employed for this purpose.

We hear from New Orleans that Mr. Walter Forbes is now exhibiting in that city a dozen samples of white paper, produced in this manner, remarkable for their fine appearance. The best quality of these only costs 21 frs. per 100 kilos. (8s. 5d. per cwt.). Calculating 500 tons of sugar canes to produce 10 tons of paper, at 8 piastres per 100 kilos. (12s. per cwt.), this is equivalent to an extra amount of 850 piastres (£127 10s.) to be obtained from the cane.

An industry could be created in our sugar colonies of the Antilles and the Indian Ocean, which would certainly be worth while to establish.”

I have thought it advisable to reproduce this article, incomplete as it is, before going fully into the subject before us, because I find in it the very same expressions as I should have used if I wished to prove undeniably the possibility of making first-class paper out of bagasse.

This article confirms the experiments which I have made, which are conclusive, and I am happy to find it stated in scientific journals, that our attempts have been tested in America, and that

* In converting these foreign moneys into English equivalents, we have taken the franc as 9½d., the rupee as 1/4½, and the piastro as 3s.

results analogous to those obtained by me have confirmed former expectations.

I would just call attention to the fact that on the 30th July, 1885, I took out at Marseilles, on my arrival from the Mauritius, a patent for an invention "to convert the bagasse of the sugar cane into papers and card-board of all kinds."

In every undertaking there is a head to conceive and also a hand to act, and it is very often to the intervention of a skilful hand that the success of an enterprise is due. I, therefore, desire to express my acknowledgments to M. Bernard de Montgolfier, of Boulieu les Annonay, who kindly assisted me, by his intelligent advice, in giving practical effect to a discovery which had been foreseen, but which no one had carried out experimentally before 1885.

What then is bagasse? It is the pulp remaining from the sugar cane, after the latter has been crushed and the sugar extracted, and it has been reduced to its simplest form. The bagasse is at present employed for heating the boilers at the mills, after it has been exposed to the sun, or dried in some other way. The substance thus dried burns rapidly, and a large number of hands are required to collect and dry it and keep the boilers constantly supplied.

Sugar planters will then find it greatly to their advantage to substitute coal for the bagasse, wherever possible, the former being less cumbrous and difficult to handle.

The proportion required is easily arrived at, for all sugar planters know that it requires one ton of coal to supply the same heat as six tons of bagasse. It is needless to add that it requires much fewer men to supply a furnace with one ton of coal than with six tons of bagasse, without taking into account the very expensive preparatory operations which the bagasse has to pass through before becoming available for fuel, whether it is dried in the sun, or by means of ovens or other apparatus lately invented.

The price of coal, delivered at Mauritius, is Rs. 30 per ton, which means, taking the proportion of six tons of bagasse against one ton of coal, that the buyer of bagasse can obtain the raw material for his paper at the rate of five rupees per ton or R. $\frac{1}{3}$ per 100 kilos.

But just as the bagasse burns rapidly, so it produces in the manufacture of paper more waste than is the case with other materials employed for this purpose. M. Montgolfier informs us that in dealing with bagasse we must reckon on a loss of from 5 to 6 to 1, that is to

say that 500 to 600 kilos. of bagasse will be required to form 100 kilos. of a product usable in the paper trade.

M. Montgolfier, whom I had supplied with bagasse from the Mauritius, was unable to convert it into paper until it had been lying in the bags more than three months, when the greater part had become reduced to powder. This proportion of 5-6 to 1 is then far from being the correct one, for when the cane stalks have just been crushed they are 5 to 6 centimetres or more in length, and so will have much less waste.

Notwithstanding this fact, I will take as the basis of my remarks the figure of 6 to 1 given by M. Montgolfier, so as to escape the charge of optimism, and all our assumptions shall be calculated on this proportion, exaggerated though it be.

Let us say, then, that it takes 600 kilos. of bagasse to make 100 kilos. of paper. Six hundred kilos. at 50 cents per 100 kilos. represent, as we have seen, Rs. 3 as the cost price. Adding to this the cost of manufacture, which amounts at the outside to Rs. $2\frac{1}{2}$ per 100 kilos., to produce the packing paper which I have the honour to submit for your inspection, plus Rs. 2, which will be about the cost of conveyance of 600 kilos. of bagasse to the works (for we are supposing here that we are dealing with a central factory receiving bagasse from different quarters), we get as cost price of 100 kilos. of this packing paper the figure of Rs. $7\frac{1}{2}$. Now, this paper will fetch at Mauritius the wholesale price of Rs. 40 per 100 kilos., leaving the very considerable margin of Rs. $32\frac{1}{2}$ between the cost and selling prices.

According to the article in the *Voleur Mauricien*, already quoted, the best quality of Mr. Forbes's bagasse paper is said to cost 21 fcs. per 100 kilos.

The sample now submitted to you only represents packing paper made from pure bagasse, the only addition being 5% of caustic soda, and can scarcely cost more than the Rs. $7\frac{1}{2}$, which we have mentioned, being about 13 francs (10s. 6d.) allowing for the exchange. But the local production being very small, I am obliged to take as the basis of further calculation the commercial value of this paper in Europe, and, therefore, quote an extract from a letter of M. Montgolfier, dated 12th March, 1887:—"You ask me what is the price of the paper manufactured from bagasse. At the time of your visit I told you that I should put it about 35 fcs. per 100 kilos., with 4% discount." It is not a matter of surprise, when we take into account the exchange, expenses,

and the profits which have to be made, that paper worth 35 fcs. (28s.) in Europe, should be sold at Rs. 40 (55s.) in Mauritius.

M. Montgolfier thus fixes the commercial value of this paper at 35 francs. Leaving aside the exchange, which would be in our favour if we sent our papers to Europe, and which would meet the cost of freight and carriage, &c., we will reckon these 35 fcs. at only Rs. 14, which would leave us a net profit of Rs. $6\frac{1}{2}$ per six hundred kilos. of bagasse. The planter would himself manufacture this paper, and would thus gain more than one rupee per 100 kilos. of bagasse, which he would be glad to gain on every hundred kilos. of sugar.

The amount of bagasse which the Mauritius would be able to supply is really enormous, if we may judge by the following calculations:—

Everyone knows that each 1000 kilos. of cane taken to the factory produces 350 kilos. of bagasse, and 650 kilos. of juice. These 650 kilos. of juice are manipulated into 80 kilos. of sugar; and we conclude that the country produces as many times 350 kilos. of bagasse as it does 80 kilos. of sugar. There are then 4,200,000 kilos. of bagasse for an estate producing 1,000,000 kilos. of sugar. But as we are here speaking of freshly crushed bagasse, which still contains 25% of moisture, we must deduct one-fourth from the above amount, which leaves still the very respectable figure of 3,150,000 kilos. of dry bagasse for an estate producing 1,000,000 kilos. of sugar.

Dividing this figure by 6, to obtain the number of kilos. of paper (as we have seen it requires six kilos. of bagasse to produce one kilo. of paper), we get 525,000 kilos. of paper, representing at Rs. 14 per 100 kilos., a sum of Rs. 73,500 (£5,050). We shall have expended, as we have already seen, Rs. $7\frac{1}{2}$ per 100 kilos. = Rs. 39,375, which would leave a profit of Rs. 34,125 (£2,345) for every million kilos. of sugar manufactured in the colony. Multiplying this figure by 130 millions of kilos., annually produced in the country, we conclude that it would thus have a new source of revenue of more than Rs. 4,000,000 (£275,000). These figures seem to need no comment.

The process of manufacture requisite to transform the bagasse into paper is very simple; the mechanical and chemical operations are very easy. But, however simple and easy they may be, we only arrived at them after patient research and numerous experiments, and it is quite natural that we should maintain silence on this point. As to the bleaching of the bagasse, it is an accomplished fact, as is shown by the report of M. A. Deros, the French Government expert, 8, Rue de la République, Marseilles.

PROCESS FOR BLEACHING THE BAGASSE FOR PAPER PULP.

The treatment to which I have submitted the bagasse for bleaching it is very similar to that which is employed for bleaching esparto grass.

The bagasse is pounded by means of a stamper, in water continually renewed, until the latter is tasteless and colourless. The perfectly divided matter is steeped in a ley of caustic soda, containing one-tenth of soda to that of the material employed. After being macerated cold for an hour, it is raised to boiling point for another hour. Care must be taken to add boiling water from time to time, to replace the liquid evaporated.

The substance already reduced to pulp is washed with running water, and as thoroughly as possible, on a fine tammy, then it is put in a bath of chloride of lime (15 kilos. of chloride, testing 110, to 100 kilos. of bagasse) until it is completely bleached.

The pulp is finally washed with great care, and passed through the dechloridiser, again washed and refined, if it is to be used for paper-making.

The method to be adopted in manufacture seems to me to be as follows:—

The bagasse, carefully picked, should be submitted to the action of a pulping machine, in which it would be at the same time washed and thoroughly pounded. Afterwards it should be lixivated under pressure (three atmospheres would probably suffice), with 10% of caustic soda dissolved in a sufficient quantity of water.

Washed after this process, and a second time passed through the pulper, the paste should be treated with chloride of lime. Finally, again washed in running water, passed through the dechloridiser, again washed, then refined, and treated like other pulps for paper-making.

To sum up, it is now ascertained that bagasse can be bleached by hot lixiviation, and by being afterwards passed through chloride of lime.

(Signed) A. DEROS.

Before quitting France, I obtained all the necessary information with regard to the cost of setting up of a paper factory in the colony, for this is the only solution of the bagasse question, which has been occupying our minds for so many years. I have had many extraordinarily cheap offers of works already existing. One of these, which cost more than 400,000frs., is now on sale at the ridiculous price of 100,000frs., in consequence of bankruptcy. After taking away the

portion that would be required for the plant to be set up in the Mauritius, what was left would still be worth at least 30,000frs., which would cover the exchange.

According to my calculations, with Rs. 80,000 we could have in the Mauritius a first-class paper factory, the following being the details:—

	Rs.
Purchase	40,000
Cost of taking down, carriage, and putting up..	20,000
Current expenses	20,000
	<hr/>
	80,000

This factory would easily be able to turn out 4,000 kilos. of paper per day, which would give a daily profit of Rs. 262, taking as base the calculations already made, making Rs. 78,600 for 300 working days in the year.

This would be almost cent. per cent. for the invested capital. Before finishing, I would point out, that besides bagasse, Mauritius possesses plenty of other sources for furnishing a continual supply to a paper factory; rags, torn sacks, maize husks, seaweed, bananas, and a thousand other fibrous plants which might be advantageously employed.

There is no doubt that a pioneer paper factory would make a deal of money in the Mauritius, if only because of the dearth of paper in the colony.

ON SUGAR CANE SEED.

Dr. W. Krüger, writing from Kagok (Java) to the *Deutsche Zucker-industrie*, refers to the work by Dr. Basset, "Traité Théorique et Pratique de la culture de la canne à sucre," which appeared last spring, and excited considerable attention amongst planters and practical sugar manufacturers. Some of his remarks are interesting as dealing, from the point of view of a practical cultivator, with the somewhat vexed question of the reproduction of the sugar cane from seed. He says:—"As regards the native habitat of the sugar cane, there are only two kinds of wild *saccharum* to be found in Java, which according to polarisation, contain from 3 to 5 per cent. of sugar in the juice, and in our opinion, neither of them can be considered as the original form of the cane, one of them (*Saccharum spontaneum* L.) because of its whole habit of growth, &c., the other (*S. glongong*) because its morphological peculiarities are so different."

It seems quite a mystery to us, how the author can possibly

consider that such numerous varieties can only have arisen by reproduction from seed. Not only is the formation of varieties possible to a remarkable extent in the case of other cultivated plants, which, as your reviewer remarks, are never propagated by means of seed, but the great variability of the cane is known to anyone who is acquainted in however small a degree with cane cultivation, and, indeed, it has up to now, been found impossible to classify the varieties of the cane in any satisfactory manner. His assertion, that the incapability of producing mature seeds cannot always have existed, is in no way confirmed by facts, but rather the opposite. Not only in the wild flora, and especially among the graminaceæ, do there exist plants which very rarely or very sparingly produce seeds (*poa bulbosa*, *andropogon ischænum*), to which also the nearest relatives of the sugar cane in the Javanese flora belong, but the few cultivated varieties of the cane are exactly on a par in this respect with the sugar cane in its most developed form.

The indisputable merit, not only of pointing out that the sugar cane bears seed, but also of obtaining plants from them, belongs undoubtedly to Dr. Soltwedel, the director of the experimental station at Samarang; unfortunately he has not published any account of the morphological and anatomical experiments in connection therewith. All the reports of such experiments which have hitherto appeared, as far as we have been able to find any such, relating at one time to sorghum seed, at another to grass plants obtained, or even where canes had actually been produced, are unreliable, for in no case is there any mention of the isolation of the seed. We need only call attention to the fact that in many cases in these experiments the entire flowering panicle of the cane has been placed in the soil, and the cane plants sprouting from these have been thought to have been produced from the seed. Errors may very well have arisen in such cases, for the panicles of the cane are capable of producing new plants by gemmation. We do not share the hopes which many are cherishing in connection with the production of seed and obtaining cane plants from seed, partly because they will never succeed in getting the cane to yield any large quantity of seed, partly because plants obtained from seed require much greater care than those from layers, and will in many respects disappoint the hopes entertained as regards quality, and finally, because they are equally exposed to the *sereh* disease, which is not to be wondered at, considering that the latter is transmissible by propagation.

ON THE SIMULTANEOUS DETERMINATION OF
SACCHAROSE AND RAFFINOSE.

BY MR. L. LINDET.

(Read before the French Académie des Sciences.)

Certain by-products of the sugar industry, such as the brown sugars, and the molasses, contain, along with saccharose, variable quantities of another kind of sugar, raffinose, which possesses a much higher rotating power than cane sugar, and in a remarkable degree falsifies the saccharimetric readings, and renders it impossible to determine the amount of saccharose.

Numerous methods have been proposed for ascertaining the amount of raffinose present in such cases, some based on polarisation with absolute methyl-alcohol (Scheibler's process); others on the inversion and polarisation of the sugars dissolved in absolute alcohol (Dr. Von Lipmann's method); again on the transformation of raffinose into mucic acid (Creydt's formula); others on the polarisation of sugar-containing liquids, before and after inversion by acids, in water (Reichardt and Britzman, Pellet, Sidersky, Creydt, Alberda, Gurning, and others).

Of all these the watery process, deduced from the work of Clerget, is the only one which is in general use. It would be perfect, if, as Mr. Scheibler was the first to remark, the rotating power of raffinose was not subject to numerous variations.

To produce inversion of sugar, M. Creydt recommends that the sugar containing liquid should be heated to 60° to 70° with 10 per cent. of concentrated hydrochloric acid for a quarter of an hour. If accurately carried out, this process, like other similar processes, gives comparative results, and I have myself been able, by inverting pure raffinose, to obtain in this manner, the rotation power of 53·6°, which agrees fairly with that of which I shall speak further on. But whenever I have departed from the instructions given by this chemist, I have immediately obtained contradictory results. If in place of heating to 67° or 70°, we heat for the same length of time and with the same quantity of acid, to 80° or 82°, we obtain for the rotation power of inverted raffinose the figure of 46·8°; if we adhere to the temperature of 67° to 70° for a quarter of an hour, and double the quantity of acid, the rotation power is reduced to 49·2%. Finally if

we keep to the same temperature and quantity of acid, but prolong the heating for another quarter of an hour, the rotation power becomes 48.4° .

A method which is so susceptible of errors is perforce imperfect, and according to the opinion of those who use it, the refiners and distillers of molasses, it cannot give accurate results.

The process which I have the honour to submit to the Academy is much less delicate. The inversion is effected by the steam of a bain-marie, and there is no need to trouble oneself about either the quantity of acid or the time necessary for inversion.

Into a phial containing the saccharine solution, strength 10 to 20 per cent., and heated in the bain-marie to 100° , I put about 20 per cent. of powdered zinc, then I drop in gradually 20 per cent. of hydrochloric acid, previously diluted with its own volume of water.

Under these circumstances the acid is saturated almost immediately, but the relative slowness with which the zinc is attacked allows sufficient time for the inversion of the sugars. When once the acid is saturated it no longer acts on the products of inversion, more particular on inverted raffinose, in the same manner as it does under ordinary conditions. Further, any fresh addition of acid, made after all the saccharine matter is already inverted (it being of course understood that an excess of zinc has been used) attacks the metal in preference to the inverted sugars. As a matter of fact, I have not observed any change in the rotation, when I have added a quantity of acid equal to 40 per cent. (instead of 20 per cent.) to a solution of raffinose where zinc was present.

Other substances, such as oxide and carbonate of zinc, produce the same effect, but they have the disadvantage of saturating the acid too rapidly, and not allowing time for the inversion of the sugars. Further, when metallic zinc is used, the hydrogen which is disengaged hinders the products from becoming coloured, and even bleaches them if they are already coloured.

The addition of the acid may take place within a time which I have varied without any ill-result from ten minutes to an hour and a half, as is shown by the following table:—

	Original		ROTATION AFTER INVERSION.			
	Rotation.		10 min.	45 min.	90 min.	
1. Raffinose ..	14.6°	7.50°	7.40° 7.50°
2. Raffinose ..	17.1°	8.75°	8.85° 8.85°
3. Saccharose.	23.4°	6.95°	7.15° 7° —

From these and similar experiments I think we may deduce, for the rotation power of raffinose inverted at 20°C, the figure of 53°, and for that of saccharose inverted under the same conditions and at 20°C, the figure of -20·1°.

I have first of all tested the method which has just been described, by experimenting on artificial mixtures of sugar and raffinose.

The rotation of the saccharine liquid being taken before and after inversion, the following equations may be constructed, where p and p' indicate the weight of sugar and of raffinose, r and r' the rotation figure before and after inversion, a and a' the rotation power of sugar (67·3°) and of raffinose (103·6°), b and b' the rotation power of inverted sugar (-20·1°) and of inverted raffinose (+53°):—

$$p + p' = r \frac{V}{\left(-\frac{p}{p + p'} a + \frac{p'}{p + p'} a' \right) l}$$

and

$$p + p' = -r' \frac{V}{\left(-\frac{p}{p + p'} b + \frac{p'}{p + p'} b' \right) l}$$

from which we get

$$p = p' \frac{r b' + r' a'}{r b - r' a}$$

By transposing the value of p in one of the equations, we get p' , and then p .

By using these formulæ, I have obtained the following results:—

		PROPORTION.	
		Employed.	Found.
1.	{ Raffinose	0·65	.. 0·66
	{ Saccharose	16·74	.. 15·61
2.	{ Raffinose	1·21	.. 1·23
	{ Saccharose	15·85	.. 15·24
3.	{ Raffinose	1·67	.. 1·51
	{ Saccharose	14·15	.. 14·28

I have afterwards analysed brown sugars and molasses by this method and found:—

	Brown Sugars.		Molasses.	
	I.	II.	I.	II.
Raffinose (per cent.)	6·57	5·76	.. 13·18	11·09
Saccharose (per cent.)	84·59	81·50	.. 53·56	48·79

The quantitative analysis of the sugars by means of Fehling's solution might be substituted for the use of the saccharometer, employing the same process of inversion. But the test by this method would be less sensitive.

In the sugar works and refineries the chemists usually operate on a fixed quantity (16 gr. 20) of the substance to be tested, and no longer read the ordinary degrees (0 to 360) but the saccharometric degrees (0 to 100). In this case a formula must be used, which is none other than that of Creydt.

We will suppose then that we have a brown sugar or a syrup to analyse. The ordinary quantity of either 16 gr. to 19 or 16 gr. 20) is to be weighed and dissolved in 100 gr. of water, adding, according as may be usual in the laboratory, either subacetate of lead, or animal charcoal in powder.

Testing this by the saccharometer, a deviation will be obtained which we will call A.

If the defecation has been made to 100-110 by means of the subacetate, the correction of the saccharometric reading will of course be made.

Of this liquid take 40 cc. (or 44 cc. in case the defecation has been 100-110), and put them in a non-graduated phial of 100 cc. This phial is to be suspended above the water of a bain-marie, in the full steam, and about 10 gr. of powdered zinc added. When the liquid in the phial has attained the temperature of the bain-marie, 20 cc. of hydrochloric acid, diluted with its volume of water (*i.e.* 10 cc. of pure acid), are to be added. This addition is to be made in fifteen to twenty minutes at regular intervals, for example, every four or five minutes as nearly as possible. The phial is then to be allowed to cool, or cooled artificially, filtered into a phial gauged to 100c., and filled up to that volume. Cool to exactly 20°C. and polarise. The deviation multiplied by 2.5 will give the deviation which should have been produced by the pure liquid. We will call the difference of the two polarisations, C, and to arrive at S and R, the actual quantity of sugar and of raffinose we shall only have to apply the two following formulæ :—

$$S = \frac{C - 0.489 A}{0.810} \quad R = \frac{A - S}{1.54}$$

PARIS EXPOSITION, 1889.

POOR SHOW OF SUGAR MACHINERY.

The remarks made by several Austrian manufacturers at the meeting of the *Mittelböhmische Zuckerfabriksverein* last month, respecting the Paris Exposition, which have excited some attention in France, will hardly surprise those of our readers who have visited the Exhibition. In the mass of remarkable objects which meets the eye at every turn, it is scarcely to be wondered at that the comparatively poor show made by the sugar manufacturers and refiners should have appeared rather insignificant. At the time of the opening of the Exhibition the *Journal des Fabricants de Sucre* lamented that this industry was so sparingly and unsatisfactorily represented. Herr Hugo Jelinek, a well-known Bohemian manufacturer, declared that he sought in vain for seven days for the sugar exhibits. This may be easily accounted for by supposing that he neglected that part of the Exhibition on the Quai d'Orsay where these exhibits are shown, though he might have found a tolerable series of samples of cane sugars in the Pavillon du Brésil. Other members of the Mid-Bohemian Association fully agree with Herr Jelinek's remarks, which also specially referred to the absence of any particular novelty in the sugar machinery shown.

Want of space has hitherto been the principal reason of our silence on this subject, but there was the further difficulty of pointing out any large number of objects which would specially interest those connected with the cane sugar industry. The two most remarkable exhibits of sugar-making machinery are undoubtedly those of the Compagnie de Fives-Lille and the Anciens Etablissements Cail.

The Anciens Etablissements Cail have a separate pavilion (in the Avenue Labourdonnaï) for their machinery, and the apparatus which most directly interests sugar manufacturers and planters is undoubtedly that belonging to the diffusion process, now coming so rapidly to the front. This large and old-established house shows a diffusion battery specially constructed to meet the requirements of the cane sugar manufacturer. One principal difference consists in the shape of the diffusers, which for beetroot have the opening for clearing out less than the diameter of the vessel, which would be impracticable in the case of the cane, as the refuse matter, whether of cane or

bagasse, so different from the soft pulpy residuum of the beet slices, would at once choke the aperture. The diffusers are therefore constructed in the shape of a truncated cone, with the base formed by a door having the same diameter as the vat, and supplied with a special closing apparatus controlled from above. This establishment also shows force pumps and filter presses of special construction, for which they hold patents.

The important Compagnie de Fives-Lille shows a large assortment of sugar-making machinery on the ground floor of the machinery building. Amongst other interesting objects are a complete diffusion apparatus, cane cutters, granulators and filters, several of these fitted with appliances which are a speciality of the machinery of this company. Other noteworthy exhibits are those of Jean and Peyrusson (turbines, pumps, and filter presses); Société Anonyme de St. Quentin (filter presses, mechanical filters and diffusion apparatus) and Alexis Godillot (self-feeding furnaces for consuming bagasse).

COST OF MAKING WEST INDIA SUGAR IN 1803.

For the first decade of the present century, our Jamaica sugar planters were in a very bad way; their losses ranging from 20s. to 40s. upon every hundred-weight of sugar they turned out.

The following particulars show the cost of making Muscovado sugar in Jamaica in 1803, which are confirmed by the Minutes of Evidence before the first and second West India Committees, held January and July, 1806.

An estate of 200 negroes made, on an average of different situations, about 150 hogsheads sugar of 13 cwt. nett. It was computed that rum paid the expense of provisions for the negroes. But, exclusive of these provisions, and even of American stores, there are island taxes, overseers' salaries, and stores from Europe; the aggregate of which costs over and above the proceeds of rum, in Jamaica 21s., and in the Leeward Islands 20s. on the cwt. of sugar produced.

Cost.

	Per Cwt. £ s. d.		
Stores from Europe, the Island taxes, and salaries, are therefore at a medium cost.	1	0	6
Freight home	0	10	0
Insurance and mercantile charges	0	6	0
Duty	1	7	0

	Per Cwt. £ s. d.		
Thus the charges on sugar, including the duty, but without any return to the planter are	3	3	6
Add the planter's return, say at 8 per cent. upon the capital (£40,000), say	1	13	0
	<u>£4 16 6</u>		

Ninety-six shillings and sixpence per cwt. is therefore the price below which sugar cannot be sold without loss.

That the return on his capital should be on an average 33s. per cwt. will be apparent when it is considered that an estate of 200 negroes must have cost the proprietor, in all, fully £40,000 sterling. The average crop of such an estate is not over-rated at 150 hogsheads of 13 cwt. each, on which 33s. per cwt. is necessary to make a return of 8 per cent. on the £40,000 invested.

As 10 per cent. was at that time the customary profit on the great branches of trade, any less return than that here allowed for would appear to the farmers and brewers an inadequate return for their risk and labour.

And if this be a legitimate profit in so healthy a climate, and so secure a country, as Great Britain, how much more is it due to those who have to run great risks in regard to the climate, not to say, at that time, the dangers of war, of living in the West Indies.

The following are the average duty paid prices in the London market for these sugars, for the years 1799—1807:—

		Per Cwt. £ s. d.					Per Cwt. £ s. d.		
1799		3	15	0	1804		4	0	0
1800		3	14	0	1805		3	16	0
1801		3	4	0	1806		3	8	0
1802		2	14	5	1807		3	0	0
1803		3	7	0					

We therefore are not surprised to find in the Report of the Committee of the House of Assembly, Jamaica, the following, respecting the position of the planters in 1805:—

“Every British merchant holding securities on real estates is filing bills in Chancery to foreclose, although when he has obtained a decree he hesitates to enforce it, because he must himself become proprietor of the plantation, of which, from fatal experience, he knows the consequences. No one will advance money to relieve those

whose debts approach half the value of their property, nor even lend moderate sums without a judgment in ejectment and release of errors, that at a moment's notice he may take out a writ of possession and enter on the plantation of his unfortunate debtor. Sheriff's officers and collectors of the internal taxes are everywhere offering for sale the property of individuals who have seen better days, and now must view their effects purchased for half their real value, and less than half the original cost. All kind of credit is at an end. Unless speedy and efficacious means are adopted for giving permanent relief, by a radical change of measures, we must suppose the West India Islands are doomed to perish as useless appendages of the British Empire."

THE DÉFIBREUR FAURE.

Our readers, says the *Journal des Fabricants de Sucre* in its notice of the Paris Exposition, have now known the Faure Defibrator for a long time.

The apparatus is attached to the fore portion of the cane mill, and does not in any way change the method of extracting or treating the juice. The preparatory process affected by it enables the mill to crush a larger quantity of cane at once, and secures a greater yield of juice. These advantages have steadily brought it into notice, and at present the (French) colonial sugar manufactories have about forty in use. Some of these have been adopted during the present year in Guadeloupe and Martinique, where the system has been employed since 1880, a proof of the appreciation of its practical value and the important results obtained by its use. It can be applied to either single or double crushing mills.

The Faure Defibrator has now stood the test of time, and is free from all the imperfections inseparable from the introduction of new apparatus, and its construction is so economically perfect that the extra profit of the first season more than suffices to cover the total cost of purchase and setting up.

A No. 3 Compound Defibrator (M. Faure, Limoges,) may be seen at the Exposition in Class 50, by the side of the exhibits of the Compagnie Fives Lille. The quantity of cane which can be passed through the Defibrator is about 18 tons per hour.

PAPER FROM BAGASSE.

Dr. A. Drache, writing from Naumburg to the *Chemiker Zeitung* on the 14th September, expresses serious doubts about the practicability of the manufacture of paper from bagasse on a large scale. A sample of packing paper which he received from the Nonpareil estate in Demerara was decidedly tender and of no commercial value as compared with the packing paper made from pure cellulose. He considers that the constitution of the cane fibre does not authorise the expectation that sound and strong paper can be made from bagasse, and his supposition as to the non-commercial success of the experiment seems borne out by the fact of the paper-machinery on the Nonpareil estate having been mostly made use of for the diffusion apparatus lately set up.*

MONTHLY LIST OF PATENTS.

Communicated by Mr. W. P. THOMPSON, C.E., F.C.S., M.I.M.E.,
Patent Agent, 6, Lord Street, Liverpool; 6, Bank Street,
Manchester; and 323, High Holborn, London.

ENGLISH.

APPLICATIONS.

11343. C. W. GUY, Anerley. *Improvements in sugar cane crushing mills.* 15th July, 1889.

11729. J. E. HATTON, London. *Improvements in sugar cane mills.* (Complete specification.) 23rd July, 1889.

12021. A. CHAPMAN, London. (Communicated by Charles Alphonso Matthey, West Indies.) *A process or method of extracting sugar from sugar cane or other sugar yielding substances, and apparatus for the purpose.* 29th July, 1889.

12022. C. W. GUY, London. *Improvements in and relating to crushing mills.* 29th July, 1889.

12393. W. FAIRWEATHER, Glasgow. (Communicated by the Balcock and Wilcox Company, United States.) *Improvements in bagasse furnaces.* (Complete specification.) 6th August, 1889.

12809. W. MAXWELL, Liverpool. *Improvements in multiple effect evaporating apparatus for evaporating or concentrating sugar juice and other liquids.* 14th August, 1889.

* M. Villers Hart takes a very different view on this subject to Dr. A. Drache, see page 535.

13555. R. RAEYMAECKERS, London. *An improved process and apparatus for the treatment of saccharine and other solutions.* 27th August, 1889.

13639. J. M. STUART, London. *Improvements in crushing mills.* 29th August, 1889.

14209. G. F. REDFERN, London. (Communicated by M. Weinrich, U.S.) *Improvements in purifying sugar and other solutions.* 9th September, 1889.

ABRIDGMENTS.

7130. H. A. HUGHES, of Rio Grand, N.J., U.S.A. *Improved process of and apparatus for disintegrating or shredding sugar cane, liquorice, dye woods, tobacco, and the like.* April 29th, 1889. The cane is cut into slices by revolving cutters, the broom or heads being at the same time removed. The slices fall on to a series of inclined vibrating trays, and are there subjected to fan blasts to still further free them from débris. After this the cane is shredded by revolving shredders, and is then ready for treatment by diffusion or otherwise.

12784. B. E. R. NEWLANDS, of 27, Mincing Lane, London. *Improvements in means or apparatus for drying slabs of sugar, applicable for heating and cooling other articles, and for analogous operations.* September 4th, 1888. The slabs are carried mechanically by a continuous belt arrangement along a series of ducts heated by hot air.

8022. C. STEFFEN, of 40, Hengars, Vienna. *An improved apparatus for producing white sugar.* May 24th, 1889. Interchangeable moulds filled with raw sugar are connected in series, and the lixiviating fluid (solution of sugar) is caused to treat them in succession. The mould containing raw sugar which has been refined are removed, and those containing partly-refined sugar, are placed in their former position in such manner that the finest mass always receives the purest liquor. A system of pipes and valves for carrying out the invention is described and shown.

10493. T. SLATER, Mechanical Engineer, of 56, Maury Road, Stoke Newington, London. *Improvements in multiple evaporating apparatus.* July 20th, 1888. The steam tubes are readily removable, and are attached at one end to a sliding chamber in such a manner that they may readily expand or contract under the influences of changes of temperature without strain.

13084. G. ADANT, of 17, Rue Manchester, Molenbeck, St. Jean, Belgium. *Improvements in the manufacture of sugar and in apparatus*

therefor. September 10th, 1888. Sugar mass is poured into an annular series of moulds and there cooled. The moulds are next placed together on a revolving apparatus, and the green syrup thereby extracted. A suitable amount of "cleare" is then passed through the slabs, which are afterwards dried in ordinary manner.

13595. J. G. LORRAIN, of Norfolk House, Victoria Embankment, London, Consulting Engineer. *Improvements in the treatment of sugar solutions.* September 20th, 1888. This inventor, instead of separating the water from solutions of sugar by means of heat, employs electrolysis. The electric current passing through the solution decomposes the water into its component gases, and leaves the sugar in large crystals. Heat may be used to aid the operation, if desired.

9994. E. MAIGROT & J. SABATES, of Havana, Cuba. *Improvements in apparatus for the manufacture of sugar by electricity.* 18th June, 1889. The saccharine juices are treated by electrolysis in tanks which are divided into central and lateral compartments by porous division plates. The inventors state that their method is effective in preventing inversion.

13655. D. STEWART, of the London Road Iron Works, Glasgow. *Improvements in centrifugal apparatus for drying sugar or other granular matters.* September 21st, 1888. Improved details of construction in connection with 6931, 1884.

AMERICAN.

ABRIDGMENTS.

407398. JAMES FOSTER, of Samarang, and J. CAMBBELL, of Soerabaya, Java. *Evaporating apparatus.* July 23rd, 1889. This specification describes a system of double or triple effect vacuum apparatus, and the inventors state that a larger percentage of juice is obtained by its use than by that of the ordinary apparatus. Drawings are necessary for a full comprehension of the plant and details.

407048. W. WILCOX and W. A. WILCOX, of Grand Rapids, Michigan. *Evaporator.* July 16th, 1889. Improvements on Patent 225815. In this device the heater is removable and may be taken away from its place when it is desired to finish off a charge of material by the employment of draught alone.

407912. A. WEBER, of New York. *Furnace for burning bone-black.* July 30th, 1889. Apparatus for burning bone-black on the regenerative system. The retorts are heated by gas generated in a separate chamber, and mixed with highly-heated air.

407976. A. WEBER, of New York. *Kiln for burning bone-black*. July 30th, 1889. Improvements on 407912 (see preceding). The material (bones) is fed, removed from the coolers, and passed to grinding mills by mechanical means.

408791. C. L. CAIRNS, of Jersey City, N.J. *Centrifugal separator*. August 13th, 1889. The basket is supported on the top of a vertical spindle, whose lower end turns in a sleeve. This sleeve has a globular projection about its middle which is engaged by a similar concave bearing, and the sleeve and spindle are normally kept upright by means of spiral springs which press against studs attached to the latter. The studs enter into short horizontal tubes whose outer ends are closed for the springs to bear against. This arrangement is for giving a yielding support to the basket.

408822. J. P. BOETTIGER, of Cold Springs, New York. *Centrifugal machine*. August 13th, 1889. The objects of this invention are to provide a basket-suspending device which will be steady and of which parts may readily be removed or duplicated.

409333. H. E. NIESE, of Jersey City, N.J. (assignor to the F. O. Matthieson & Wiecher's Sugar Refining Company, of same place). *Process of refining sugar*. August 20th, 1889. Consists in maintaining the magma at a constant temperature of about 120° F. during crystallization. Any portion whose temperature rises above the required point is removed and cooler magma substituted.

409572. T. GAUNT, of Brooklyn, New York. *Apparatus for evaporating liquids*. August 20th, 1889. The main feature of this apparatus appears to be an undulating evaporating surface. The plant is made in similar sections for convenience in fitting or transit, and by this construction a single or double effect may be obtained.

GERMAN.

ABRIDGMENTS.

46913. C. T. LIERNUR, Berlin. *Evaporating Apparatus*. 27th July, 1888. This apparatus moves on pivots and consists of heating pipes partly surrounded by a steam coil. This is so arranged that the liquid which does not flow through the discharge pipe can flow back between the pipes which are not surrounded by the coil. Water gauge indicators partly filled with condensation water, are provided for ascertaining the condition of the running liquid.

46572. F. RASSMUS, Magdeburg. *A test filter applicable to the separation pans of sugar works*. 3rd June, 1888. The test filter

is formed of a vessel divided in half. These halves have a filter plate between them, and are connected by a bayonet joint and gutta percha ring. They are made so as to be easily disconnected. The upper half is provided with a glass head piece, a conducting pipe for the filtered juice enters same. The under half is likewise provided with a glass tube which serves as a water gauge. A water-tight box is fixed on both glass pipes. This box besides being placed in communication in several places with the outer air is connected by tubular stays or bores with the glass head piece, the conducting pipe, the suction pipes connected with the separating pans, a pipe connected with an air pump and a water gauge and a suction pipe. The cock is made so as to assume three different positions. By the use of this apparatus a sufficient quantity of the liquid to be filtered is drawn through the pipes into the glass head from whence it is rapidly filtered by vacuum into the under part of the actual filtering apparatus. Air is then admitted by means of the main cock and the liquid is drawn off for chemical examination by means of a discharge cock.

46745. N. TSCHERIKOWSKI, Smiela, Russia. *Process and apparatus for producing refined sugar from sand sugar.* 1st December, 1888. Pure white crystal sand sugar is mashed by means of steam of two to three atmospheres, so that in a few minutes a boiling sugar mass is produced. This pulp is cooled by submitting it to an artificially-regulated temperature at from 29 to 30 degrees C., within a few hours, which produces crystallisation. The principal part of the apparatus is composed of a drum which moves on pivots. A central pipe, with stuffing box attached, admits steam to the drum. Sloping stirring-shovels and a row of discharge openings, made so as to open or close at will, conduct the sugar mass into a cooling vessel containing the sugar moulds.

BELGIAN.

ABRIDGMENTS.

75168. C. LIEVENS SOYEZ, Laeken. *Improved machine for the manufacture of sugar, etc., entitled—"Etireuse coupeuse Lievens."* November 9th, 1886. The essential characteristic of the machine, forming the object of this invention, consists in the arrangement of the cylinders, which work in pairs. Two of these cylinders serve to draw out the material, and work in a circular direction, the other two receive the material drawn out, being crossed by the first pair in a longitudinal direction. These cylinders are set in motion by a crank or pulley, on the shaft of which is fixed the machinery for setting the whole machine in motion.

75336. F. KROEGER, Liege. *Improvements in the crystallisation of sugar candy and in apparatus therefor.* November 22nd, 1886. The inventor claims, for carrying out the process patented under No. 69396, the use of a vat with non-perforated sides, simple, arched bottom and frame, at the lowest point of which vat is placed the mechanism for causing the syrup to flow, which mechanism is composed principally of the cage, the hollow glass cylinder and the movable shaft.

75509. A. & L. Q. BRIN, Brussels. *Improvements relating to the manufacture of sugar.* December 6th, 1886. The inventors dissolve the raw sugar and pass through solution, which is kept in constant movement, a current of ozone. The ozone takes the colour out of the solution, and escapes in the form of oxygen, which is capable of being again transformed into ozone to be employed again as above described, and so on. The sugar solution, after treatment with ozone, may be filtered through suitable material, and afterwards concentrated and crystallised, so as to form a marketable product.

75790. E. REBOUX, Brussels. *Improvements in the saccharification of the worts of Jerusalem artichokes, &c.* December 31st, 1886. The process consists in obtaining saccharification at a high temperature without using steam in the saccharifier. By means of a small air pump or compressor, the air is driven into an iron piping which passes through the flues of the generators or round the furnaces, so as to acquire a high temperature. The piping, suitably lined with a heat-resisting coating, ends in a receiver, where the air pressure is regulated by means of a counter-weighted escape valve. The temperature is regulated by the speed of the compressor by taking in more or less air in a given time. The superheated and compressed air is injected into the juice or wort first in the open air up to boiling point or any other temperature, then, if saccharification under pressure is desired, the escape cock of the apparatus is closed. The agitator is set in motion as in the ordinary well known saccharifiers, and the pressure and temperature desired during the working of the apparatus may be regulated at will.

Patentees of Inventions connected with the production, manufacture, and refining of sugar will find *The Sugar Cane* the best medium for their advertisements.

The Sugar Cane has a wide circulation among planters in all sugar producing countries, as well as among refiners, merchants, commission agents, and brokers, interested in the trade, at home and abroad.

IMPORTS AND EXPORTS (UNITED KINGDOM) OF RAW
AND REFINED SUGARS.

JANUARY 1ST TO AUGUST 31ST, 1888-1889.

Board of Trade Returns.

IMPORTS.

RAW SUGARS.	QUANTITIES.		VALUE.	
	1888.	1889.	1888.	1889.
	Cwts.	Cwts.	£	£
Germany	2,974,059	3,618,827	1,936,581	3,063,403
Holland	209,515	339,227	134,536	284,700
Belgium	423,412	479,333	270,885	334,650
France	10,255	124,076	7,075	110,000
British West Indies & Guiana	1,775,896	1,457,841	1,412,245	1,388,798
British East Indies	939,053	1,419,344	453,372	969,572
China and Hong Kong	4,080	23,856	2,420	20,455
Mauritius	152,682	203,687	105,715	213,291
Spanish West India Islands	304,376	46,400	233,412	41,890
Brazil	2,104,154	696,792	1,322,650	498,436
Java	3,038,206	985,295	2,286,185	966,152
Philippine Islands	413,431	505,701	201,525	326,778
Peru	345,110	397,993	254,496	344,893
Other Countries	468,721	580,349	337,604	515,981
Total of Raw Sugars ..	13,162,950	10,878,721	8,948,701	9,078,990
Molasses	290,857	312,998	89,137	114,831
Total Sugar and Molasses .....	....	....	9,037,838	9,193,830
REFINED SUGARS.				
Germany	2,055,573	2,837,211	1,792,689	2,959,167
Holland	928,290	855,059	842,279	895,543
Belgium	136,600	163,753	130,164	176,136
France	538,995	1,100,216	492,137	1,198,765
United States	39,953	9,667	37,207	9,242
Other Countries	382,991*	614,921	304,276*	617,872
Total of Refined	4,082,402	5,580,832	3,598,752	5,850,725

EXPORTS.—REFINED SUGARS.

	Cwts.	Cwts.	£	£
Sweden and Norway	50,934	44,949	42,328	40,206
Denmark	58,094	73,368	42,607	61,482
Holland	55,580	57,679	40,755	49,377
Belgium	19,204	16,847	13,656	12,640
France	4,229	5,240	2,896	4,152
Portugal, Azores, & Madeira	51,002	39,416	37,462	33,912
Italy	59,204	53,655	43,759	47,890
Other Countries	116,156	85,476	92,536	79,415
Total of Exports	414,409	376,630	315,699	329,074

* Imported almost entirely from Russia.

IMPORTS OF FOREIGN REFINED SUGAR.

The British Sugar Refiners' Committee furnish us with the following figures, giving the imports of foreign refined sugar for the month of August, 1889, compared with the corresponding month of the two preceding years, and the average monthly imports for the year compared with those of 1886, 1887, and 1888, distinguishing the quantities of "Lumps and Leaves" from "other sorts," and giving the separate imports from each country:—

Countries from which Sugar has been imported.	"LUMPS AND LOAVES."						"OTHER SORTS." Including Crushed Loaf, Granulated, Crystallized, &c.						TOTAL.					
	Monthly Average.			Aug.	Aug.	Aug.	Monthly Average.			Aug.	Aug.	Aug.	Monthly Average.			Aug.	Aug.	Aug.
	1886	1887	1888	1889	1887	1888	1889	1886	1887	1888	1889	1886	1887	1888	1889	1886	1887	1888
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
France.....	1462	1363	1636	1935	2020	1362	1199	2688	5099	4856	4940	5183	1401	3015	7203	2763	4818	Tons.
Holland	3508	3780	3267	2379	3272	4326	906	1428	2483	2675	2904	2236	2399	2502	5942	6725	3108	Tons.
Germany & Austria ..	990	1347	1510	2792	784	1329	1118	6634	10463	11729	16029	6908	7962	6625	17731	7782	9291	7743
Belgium	344	592	622	803	574	674	411	113	308	227	219	202	143	55	900	849	1022	406
United States	854	454	8	..	394	..	..	5078	2804	157	60	1393	20	32	5932	3238	185	60
Russia .....	..	3	..	34	..	..	..	3412	452	1059	2939	1448	3688	543	3112	455	1959	2073
Other Countries ....	..	..	1	352	..	..	5	9	15	2	520	..	..	537	9	15	3	872
Total	7158	7539	7094	8205	7044	7691	3639	10362	21634	21604	26671	17409	15613	13013	26520	28163	28698	34876
																		24501
																		23304
																		17552

SUGAR STATISTICS—GREAT BRITAIN.

TO SEPTEMBER 21ST, 1889 AND 1888. IN THOUSANDS OF TONS, TO THE NEAREST THOUSAND.

	STOCKS.		DELIVERIES.		IMPORTS.	
	1889.	1888.	1889.	1888.	1889.	1888.
London	46	53	224	225	242	224
Liverpool ..	76	117	219	234	201	267
Bristol	1	1	40	37	38	34
Clyde	24	25	170	183	176	165
Total ..	147	196	653	679	657	690
	Decrease.. 49		Decrease.. 26		Decrease.. 33	

SUGAR STATISTICS—UNITED STATES.

(From Willett and Hamlin's Circular.)

FOR THE FOUR PRINCIPAL PORTS. IN THOUSANDS OF TONS, TO THE NEAREST THOUSAND. FOR AUGUST, 1889 AND 1888.

	STOCKS.		DELIVERIES.		IMPORTS.	
	September 2nd.		In August.		In August.	
	1889.	1888.	1889.	1888.	1889.	1888.
New York	42	68	67	74	68	46
Boston	4	11	3	17	3	17
Philadelphia....	..	3	17	21	12	19
Baltimore .....	..	..	..	..	..	..
Total.....	46	82	87	112	83	82
	Decrease.. 36		Decrease.. 25		Increase.. 1	
Total for the year			780	757	794	791

NEW YORK PRICES FOR SUGAR.

From Willett, Hamlen & Co.'s Report, September 12th, 1889.

FAIR REFINING.	96c/o CENTS.	GRANU- LATED.	STAND. A.	STOCK IN FOUR PORTS.
Sept. 12, 1889.—5½c.	6½c.	8½c.	8c.	Jan. 1, 1889— 32,254 tons.
Sept. 13, 1888.—5½c.	6½c.	7½c.	7½c.	Jan. 1, 1888— 47,798 tons.
Sept. 15, 1887.—4½c.	5½c.	6 5-16c.	5½c.	Jan. 1, 1887—102,279 tons.
Sept. 16, 1886.—4½c.	5½c.	6-6 1-16c.	5½ 11-16c.	Jan. 1, 1886— 57,323 tons.
Sept. 17, 1885.—5 7-16c.	6 3-16c.	7c.	6½c.	Jan. 1, 1885— 89,186 tons.
Sept. 11, 1884.—5c.	5 11-16c.	6 11-16c.	6 3-16c.	Jan. 1, 1884— 60,900 tons.
Sept. 13, 1883.—6 9-16c.	7 9-16c.	8 11-16c.	8½c.	Jan. 1, 1883— 50,297 tons.
Sept. 14, 1882.—7½c.	8c.	9½ 3-16c.	8½c.	Jan. 1, 1882— 43,927 tons.
Sept. 15, 1881.—7½c.	8½c.	10-10½c.	9½c.	Jan. 1, 1881— 66,999 tons.
Sept. 9, 1880.—7½c.	9c.	10½c.	9½c.	Jan. 1, 1880— 63,558 tons.

STOCKS OF SUGAR IN THE CHIEF MARKETS OF EUROPE ON THE
31ST AUGUST, FOR THREE YEARS, IN THOUSANDS
OF TONS, TO THE NEAREST THOUSAND.

Great Britain.	France.	Holland	German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1889.	TOTAL 1888.	TOTAL 1887.
234	103	6	31	40	17	431	413	542

CONSUMPTION OF SUGAR IN EUROPE FOR THREE YEARS, ENDING
31ST AUGUST, IN THOUSANDS OF TONS, TO THE
NEAREST THOUSAND.

Great Britain.	France.	Holland	German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1889.	TOTAL 1888.	TOTAL 1887.
1276	443	40	398	246	354	2757	2721	2686

ESTIMATED CROP OF BEET ROOT SUGAR ON THE CONTINENT OF EUROPE
FOR THE PRESENT CAMPAIGN, COMPARED WITH THE ACTUAL CROP,
OF THE THREE PREVIOUS CAMPAIGNS.

(From *Licht's Monthly Circular*.)

	1889-90.	1888-89.	1887-88.	1886-87.
	Tons.	Tons.	Tons.	Tons.
France.....	550,000 ..	470,000 ..	392,824 ..	485,739
German Empire ..	1,100,000 ..	990,000 ..	959,166 ..	1,012,968
Austro-Hungary ..	700,000 ..	525,000 ..	428,616 ..	523,059
Russia and Poland.	525,000 ..	510,000 ..	441,342 ..	487,460
Belgium	180,000 ..	140,000 ..	140,742 ..	135,755
Holland	55,000 ..	45,000 ..	39,280 ..	36,098
Other Countries..	60,000 ..	55,000 ..	49,980 ..	49,127
Total....	3,170,000	2,735,000	2,451,950	2,730,206

Mr. Licht's present Estimate as compared with the previous month. shows an increase of 255,000 tons, viz., France, 45,000 tons; German Empire, 70,000 tons; Austro-Hungary, 70,000 tons; Russia and Poland, 25,000 tons; Belgium, 35,000 tons; Holland, 8,000; and other Countries, 2,000 tons. Mr. Görz's Estimate for 1889-90, is 2,788,000 tons, or nearly 400,000 tons below Mr. Licht's.

STATE AND PROSPECTS OF THE ENGLISH SUGAR MARKET.

A further fall of about 2s. per cwt. has taken place all round, raws and refined, during the past month; 88% beet is now quoted at 13s. per cwt., which is lower than it has touched since November, 1888. Forward quotations up to March next year, are within 3d. of present price.

Mr. Licht has just increased his estimate for next crop by 255,000 tons! if we compare his estimate with that of Mr. Görz, we find a difference of about 400,000 tons! These statistics may serve the purposes of "bears" and "bulls," but the legitimate trader will in time cease to put any reliance upon them.

The imports of foreign refined in August, were 17,552 tons, against 23,304 tons in August, 1888, and for the eight months, 1889, 279,260 tons, showing an increase upon same period last year of 75,131 tons.

The deliveries into the United Kingdom (four principal ports) up to 21st September, show a decrease, as compared with 1888, 25,620 tons, and the imports a decrease of 32,720 tons.

The stocks at the four principal ports of the United Kingdom, on 21st September, were 146,876 tons, a decrease upon 1888 of 49,172 tons.

Present quotations for the standard qualities, as under, are:—


FLOATING.		Last Month.
Porto Rico, fair to good Refining	15/- to 16/- against	17/3 to 18/6.
Cuba Centrifugals, 97% polarization	16/6 to 16/9	„ 18/6 to 19/-.
Cuba, fair to good Refining	15/6 to 15/9	„ 17/6 to 18/-.
Java, No. 14 to 15 D.S.	17/- to 17/3	„ 19/- to 19/3.
British West India, fair brown	15/6	„ 18/-
Bahia, low to middling brown	11/6 to 12/9	„ 13/6 to 14/-.
„ Nos. 8 to 9	13/6 to 14/-	„ 15/9 to 16/3.
Pernams, regular to superior Americans. .	13/6 to 15/6	„ 15/- to 17/-.
LANDED.		Last Month.
Madras Cane Jaggery	10/9 to 11/- against	12/6 to 13/-.
Manila Cebu and Ilo Ilo	10/- to 11/-	„ 12/- to 13/6.
Paris Loaves, f.o.b.	20/-	against 22/6 to 22/9.
Russian Crystals, No. 3, c.i.f.	17/3	„ 20/-
Titlers	22/6	„ 24/-
Tate's Cubes	23/-	„ 25/-
Beetroot, German, 88%, f.o.b.	13/-	„ 15/-

THE SUGAR CANE.

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 The writers alone are responsible for their statements.

N.B.—All communications to be addressed, and Cheques and P.O. Orders made payable to THE PROPRIETOR, 6, Ward's Buildings, Deansgate, Manchester.

For Scale of Charges for Advertisements, see page xi.

For Table of Contents, see page i.

Sir John Gorrie, the Chief Justice of Trinidad, will return home next year, and take his pension. It will then be twenty-five years since he entered the colonial service as Advocate General at the Mauritius. It is understood that it is Sir John's intention to enter Parliament for a Scotch borough.

The announcement is made of the appointment of Sir Charles Cameron Lees, Governor of Barbados, to the Governor of Mauritius, in succession to Sir John Pope Hennessy, who retires on the completion of his term of office.

Sir Walter J. Sendall, now Governor of the Windward Islands, has been promoted to the Governorship of Barbados.

We regret to hear of the decease, on the 30th September, of James McCormick, Esq., of Porto Rico, an occasional contributor to these columns, who was well-known and much respected, for the great interest which he took in all subjects concerning the agricultural interests of the Island, particularly the question of Central Factories.

The Lord Mayor of London has put himself at the head of a movement to regenerate fruit culture in this country, and all well-wishers to the land must heartily endorse his efforts. We, undoubtedly, pay an enormous sum annually for fruit, which might just as well be grown at home as by foreigners. Fruit cultivation is profitable,

when well understood, and it is a good feature of the movement now initiated, that besides awarding prizes to stimulate competition, information on orchard culture is to be diffused. The counties are to be dealt with according to their climate and soil, and prizes will be offered in succession for competition in the various districts.

We give on page 593 two tables which will be found useful whenever our readers should desire to calculate the position of the German sugar producer as compared with that of the colonial planter. The first gives the percentage of raw and refined sugar obtained during the last nine years. The second table gives the cost prices and amount of premium gained on one centner (110½lbs.) of raw sugar at the large Culmsee factory for the last five years. Even with the present reduced premium and enhanced cost price of beets this factory is able to pay a dividend of 6%. Many of the German factories, however, show much more favourable results than the Culmsee factory, as will be seen from the following table of results, announced during the past month, and the percentage of unfavourable results is comparatively small, and is in almost every case to be attributed to local or temporary causes.

DIVIDENDS DECLARED.

Kosten (capital, M.217,500), 25%; *Fraustadt* (capital, M.1,100,000), 18%; *Kujavien* (capital, M.900,000), 15%; *Opalenitz* (capital, M.1,100,000), 15%; *Trachenberger Zuckersiederei* (capital, M.1,200,000), 14%; *Brunonia* (Brunswick), 12%; *Rositz*, 10%; *Löbau* [Oberlausitz] (capital M.1,200,000), 8%; *Bredow* (capital, M.1,200,000), 7%; *Wreschen* (capital, M.675,000), 5%; *Waghäusel* (capital, M.4,715,000), 4½%; *Klein-Wanzleben* (capital, M.2,700,000), 5% and 4%; *Maingau* (capital, M.702,000), 4%; *Emmerthal* (capital, M.790,000), 4%; *Altfelde* (capital, M.600,000), 3%.

NET PROFITS SHOWN.

Kruschwitz (capital, ordinary shares, M.1,500,000, and preference shares, M.1,200,000), clears off a debit balance, from former years, of M.211,112, and has M.7,985 still to good; *Wevelhovingen* [Gilbach] (capital, M.600,000), shows a profit of M.176,447; *Bedburg* (capital, M.666,000), M.94,512; *Markranstadt* (capital, M.450,000), M.82,788; *Zülz* (capital, M.814,200), M.62,372; *Neustadt*, in Ober Schlesien, (capital, M.750,000), M.46,730; *Langenwedding* (capital, M.240,000), M.41,033; *Grossmahner* (capital, M.416,100), M.30,187; *Bernstadt* (capital, M.705,000), M.13,590; *Riesenburg* (capital, M.560,000),

M.10,453. The latter goes against a debit balance from former years of M.105,631.

Melno, with a capital of M.594,500, shows neither gain nor loss.

The Halle Sugar Refinery is expected to pay a dividend of 10%. That of Magdeburg, 6% on ordinary and 7% on preference shares.

LOSSES ANNOUNCED.

Hünfeldt (capital, M.377,700), M.30,125; there was also a loss from last year of M.40,183,—both have been covered from reserve fund. *Scheune* (capital, M.424,000), loss M.24,446; *Schaumburg* (capital, M.422,400), M.7,497.

AUSTRIA.—Dividends announced: Lobositz, 7%; Wawrowitz, 17%; Troppau Refinery, 18%.

New factories are to be erected at Friedland, at Neubrandenburg, and at Wismar (all in Mecklenburg), and at Diezdorf, in Silesia. Also at Cellechowitz (Moravia) in Austria, and at Iwanino in Russia.

MEXICO.—It is reported that English and American capitalists, especially Louisiana sugar planters are endeavouring to obtain land in Mexico for sugar plantations. The estate of Sr. Mendoza Cortina, at Cuaquatla (Moreles), has been purchased by a Syndicate of English and American capitalists, for \$250,000.

The *Journal des Fabricants de Sucre* gives some figures relating to the falling off in consumption during the continuance of the high prices, but omits, in two cases, to state the period from which the calculation commences. Mr. Dureau says:—

“In Germany, as a consequence of the high prices the consumption showed, on the 30th September, a deficit of 42,900 tons. For Austria-Hungary, on the same date, the deficit in the consumption was 39,100 tons. In the United States, according to the latest information, the quantity refined, which forms the criterion of the consumption, showed a deficit of 114,251 tons for the four months, June to September. Finally, in France there is a difference for the nine months of this year, as against last year, of 23,576 tons, which is equivalent to a reduction of 14,145,600 francs in the Treasury receipts.”

The *Prager Zuckermarkt*, which has of late years been tolerably accurate in its estimates, gives the following as the probable production of beet sugar for the current campaign of 1889-90. Such figures can, however, be only regarded as approximative guesses.

	1888-89. Tons.		1889-90. Tons.		Differences. Per Cent.
Austria	515,000	....	630,000	....	+ 22
Germany	978,500	....	1,030,000	....	+ 5
France	460,500	....	546,000	....	+ 18
Russia	515,000	....	486,000	....	- 6
Belgium	125,500	....	141,000	....	+ 12
Holland	30,000	....	35,000	....	+ 16
Other Countries ..	26,000	....	30,000	....	+ 15
	<hr/> 2,650,500		<hr/> 2,898,000		<hr/> + 9

The Constancia central factory at Los Abreus (near Cienfuegos, Cuba,) is at present the largest in the world. It produced, last campaign, 23,334 hogsheads (of 1,500lbs.) of sugar, and the new arrangements which are being made will enable it to produce 35,000 hogsheads next campaign, and 50,000 in that of 1890-91.

Up to this time the large central factory in Hawaii, producing from 10 to 12 thousand tons of sugar per annum, had been considered as the largest, but the "Constancia," having already produced 15,625 tons, has eclipsed it.

The largest beetroot sugar works are those of the central factory at Cambrai (France) and of the factory at Wanze (Belgium).

The progress of cultivating the cane for the purposes of making sugar has given rise to the erroneous supposition that the migration of the sugar cane under the Europeans was from Sicily and Spain, to the Madeira and Canary Islands; and afterwards to the West Indian Islands, Mexico, Peru, and Brazil; and that it was not an original plant of those countries.

There is besides great difficulty in distinguishing, in the journals of voyagers, between the history of the plant and its produce. For often when some particular period is mentioned, when the sugar cane was first carried to countries, the fact is, that such period was the time when the cultivation of the plant, for the purposes of making sugar, was introduced, which before was either entirely neglected, or the use of the simple juice only known, and frequently mention is made when sugar was first produced in some countries, which in reality was the period when the European art of refining it, or some improvements in its manufacture, was carried thither.

On page 604 *et seq.* will be found a Report of the mode of manufacturing sugar in India some sixty-five years ago, which will interest East Indian readers as a basis of comparison with existing circumstances.

THE FRENCH COLONIES AT THE PARIS EXHIBITION.

(From the *Journal des Fabricants de Sucre.*)

If the Colonial Exhibition incontestably offers much that is interesting to the general run of visitors, this is not the case, as regards specialists, with the part which relates to the sugar industry. The great cane sugar industry, on which depends the prosperity of our principal colonies, occupies, in fact, only an extremely modest space on the Esplanade des Invalides, and we have sought in vain for any attempt to represent the important rôle which the cultivation of the cane and the extraction of sugar play in the agriculture and industry of the French colonies.

There is no lack, however, in Guadeloupe, Martinique, or Réunion, of men with initiative, for whom the materials need not be wanting to organise an exhibition worthy of the industry they represent. Why is it that they have been contented with sending to the Exposition a few samples of sugar and rum? We are unable to explain this.

In the absence of documentary information with regard to the recent progress of the French colonial sugar manufacture, we confess we were at a loss to know how we could successfully execute our task. We felt that we had not a sufficiently powerful imagination to be able to find material for an interesting article in the contemplation of a glass jar of sugar, and besides that, it is our duty to speak of what we have seen, and not of that which has not been shown us. Luckily, the Société des Etudes Coloniales et Maritimes has come to our aid by sending us an excellent small guide-book, which it has just published under the title of *Colonies Françaises et pays Protectorat à l'Exposition Universelle*. This guide,* illustrated by Pierre Vignal, contains a series of well written papers from the pen of the most competent members of the Society. We have gleaned from thence some information on the state of the sugar industry in our principal colonies—Guadeloupe, Martinique, Réunion, &c.

At Guadeloupe the principal cultivation is that of the sugar cane. One would certainly not suspect that such was the case on paying a visit to the exhibits of this colony, in which there figure only a few samples of sugar. The sugar cane is said to have been planted in this island as far back as 1644. The only variety cultivated since

* Leopold Cerf, 13, Rue de Médicis, Paris.

1790 is the Tahiti cane. Next come coffee, manioc, and food plants, bananas, yams, maize, etc. According to the official statistics of 1888, the cultivation of the sugar canes occupies an area of about 57,000 acres, and employs 48,677 hands. The cultivation of food plants extends over about 32,500 acres, employing 21,554 hands. Then come, in the order of the area occupied, coffee, about 8,800 acres, with 6,021 hands; the cacao, 2,430 acres, with 560 hands; cotton, pine-apples, &c.

"Sugar planting," says M. Louis Farges, "passed through a crisis in Guadeloupe, as elsewhere, in consequence of the competition of beet sugar, and also from causes of another kind. The colony, however is struggling energetically. "As in Martinique," says M. de Lanessan, "so in Guadeloupe some twenty central factories have been established, and are doing equally good service. On the Grande-Terre the nature of the ground has allowed them to avail themselves easily of the small narrow-gauge railways, which run to the centre of the estates and collect the cane, to the great advantage of the proprietor and of the works. The most remarkable of these factories is the one built on the Arboussier Estate, in the neighbourhood of Pointe-à-Pitre. Everything in the way of progress and conveniences has been utilised to make it the finest establishment in the colony."

"The production in sucre d'usine and raw sugar amounted in 1887 to 48,907 tons. In addition there were 1,550,870 gallons of syrup and molasses, and 709,480 gallons of tafia.

"Coffee also passed through a crisis in consequence of the disease of the coffee-plant. However, the colony produced 11,378 cwt. of coffee in 1887. On the other hand the cultivation of the manioc increased. In 1887 the production was 15,250 tons, net value £80,375. Besides the agricultural industries Guadeloupe only possesses a few tanneries, limeworks, and potteries. The salt works of St. Martin must also be mentioned."

Sugar is then the principle product of Guadeloupe. If the sugar industry were to disappear it would mean inevitable ruin for that colony. Why then are not the large central factories of Guadeloupe better represented at the Exhibition, why have they not asserted their existence and made evident the important services which they render to the colony? We can only deeply deplore this silence, this almost complete abstention on the part of a great industry which must have made notable progress since the application of the principle

of equivalence, and ought to desire to show the extent to which it has utilised the allowances for manufacture (*bonis de fabrication*) which have been granted to it since 1884, if these allowances have been to the advantage of the cultivation, if they have operated in the direction of alteration of machinery, or of realising any sort of improvement.

The sugar exhibits from Martinique call for the same criticism, as is further proved by the remarks made by M. L. de Feissal in his report on them:—

“A score of fine sugar factories, only one of which has succumbed in the course of the crisis which lately raged in this industry, are at present in existence on the soil of Martinique. These establishments, provided with the most improved apparatus, are in no way behind the progress of the age, the machinists of the mother country being continually occupied in executing their orders. Each of these centres of production has supplied itself, at the expense of the proprietors or shareholders, and with no help from subventions, with a network of railways for the transport of the raw material. So great is the labour and care required in this industry, that it is absolutely necessary to recruit labourers from abroad. The cessation of immigration has occasioned great inconvenience in Martinique. The sugars produced in these large factories need fear no comparison with others, they even possess over similar products from the beet an advantage which secures them the preference with the consumer; the savoury odour of the sugar cane remains in spite of all the manipulations they undergo.”

“It is very difficult,” continues M. de Feissal, “to explain the want of forwardness shown by the managers of the large works in Martinique to exhibit their products. Perhaps they thought that in the midst of so many picturesque and unknown objects, an article of food which one sees on every table would have little attractions for the public curiosity. If such be the motive of their abstention, our compatriots have failed to do justice to themselves; however common an article may be, there is a legitimate interest attached to the intelligent labour which produces it. M. Bougenot, the eminent founder of these factories, is the only one whose name appears in the catalogue. No one is better qualified to maintain the renown of the Martinique sugar manufacture, for no one has done more for its progress and development. The guide-book ought also to have mentioned the fine products sent by the Pointe-Simon Works (*Société des usines de la Martinique*); it has passed them over in silence, but

this apparent injustice is atoned for by a circumstance which shows clearly to what extent it has been involuntary. In the first hall to the left of the vestibule of the Palais des Colonies, we find the crystallised sugars of the Pointe-Simon Works, and we have been totally unable to discover those of M. Bougenot, which ought not to be less remarkable. The firm "Les Héritiers Pécoul" shows fine raw and turbinéd sugars."

The exhibits of the island of Réunion seems to us somewhat more complete, although they leave something to be desired as regards information about the state of the sugar industry, the agricultural and technical conditions, the labour question, &c. M. A. Sicre de Fontbrune has fortunately supplied us with some data on these different points which are worthy of being quoted:—

"The extension of the cane cultivation dates only from the beginning of the century, but the sugar industry has made rapid progress. After some years of brilliant prosperity, difficulties began to arise, such as exhaustion of the soil, diseases of the cane, invasions of insects, and finally depreciation of the prices of sugar, resulting from over-production. Hence came the necessity of improving on the old methods of cultivation, to increase the returns and diminish the expenses. As there was a scarcity of labour, the work of machinery has been to a great extent substituted for that of men; the poorer lands have been abandoned and only the better tracts cultivated, and by means of rotation cropping, and the use of manures, artificial and others, the crops obtained from the lands which have been kept under cultivation have been gradually increased. Thus the cane crops of the Crédit Foncier Colonial, which in 1880 averaged 8 tons per acre, attained 15 tons in 1886, and exceeded 16 tons in 1888. Less land is cultivated than formerly, but it is better cultivated. Then the number of works was reduced. Those which were the worst supplied with machinery have been closed, those which were kept in work have been improved. Proceeding thus in the path of improvement, they will soon be led to adopt the diffusion process, and a new era may dawn on the colonies. Réunion, which some years ago produced very fine white sugar destined for consumption, appears to have nearly given up this manufacture, at any rate we find only one sample, which is shown by the Crédit Foncier Colonial. The production of ordinary sugar has been found more profitable, and so nearly all the sugars exhibited are intended for

refining. Although no use has been made of bone black or other decolourising agents, the greater part of these sugars, even those of the second and third jets, are remarkable for good colour and crystallisation, which indicate considerable richness. The colony exports annually from 35,000 to 40,000 tons of sugar."

The question of labour, which for our colonies is a capital one, suggests to Mr. Sière de Fontbrune the following reflections;—

"Compelled as she is to produce sugar, Réunion ought to produce all the more in proportion as the price has considerably fallen of late years. Unfortunately, the figures show us that the production is annually declining. About 1860 the average annual export was 60,000 tons. At present it is not above 35 to 40,000 tons. The revenue from this principal cultivation has thus diminished by more than half. This is a great peril for our colony, and our maritime commerce is, equally with the colony, directly interested in again increasing the production of the island.

"We have already stated that the inhabitants direct their attention to the cultivation of only the best lands, so as to decrease the cost of producing the crop; but it is also the want of labourers which compels them to do this, they are even obliged nearly every year to leave standing a portion of their ripe canes, for want of hands to cut them! When the colony was producing 60,000,000 tons of sugar, it possessed 75,000 foreign labourers. At present it has not more than 32,000, we can then understand why the production is reduced by half. The only hands that can be counted on are the creoles. To begin with, their number is insufficient. Then their wants are few, and the pay of two or three days labour per week suffices to satisfy them. To induce those to work whom necessity does not compel to labour, we should have to offer prices which are no longer on a level with the situation of the industry. From the earliest times labour has had to be sought from without. We do not intend to speak of the slave trade, which was so justly proscribed, but of the immigration of Kaffirs, regulated in 1875. The recruiting of labour on the coast of Africa has been accused of keeping up the horrible razzias of the Arabs in the interior of the continent, and England succeeded in obtaining the suppression of this by making France the offer to replace the Kaffirs in our colonies by Indians. Was England's aim in doing so a humanitarian one? In that case her aim has not been attained, for the war of extermination has continued in Central

Africa. It now seems evident that the English Government was guided by calculating aims. The African immigration was making the fortune of our colonies, and England had neither the right nor the power to put an end to them. To-day, in consequence of the intrigues of England, India is closed to us, and Africa is not open."

M. Sicre de Fontbrune sees in this an imminent danger, and thinks that if our politicians do not remedy the situation the clever calculations of the English Government will result in the near ruin of the French colonies.

Of Mayotte, the protectorate of the Comoro Isles, and Nossi-Bé, we shall not say much. According to M. A. de Fraymoreau, an estate owner in Mayotte, this island is indebted to the admirable fertility of its soil for having become an agricultural colony of some importance. It is, in fact, the fourth French colony in importance as regards sugar production, and also produces vanilla which rivals that of Réunion. There are three large sugar factories on the very fertile isle of Anjouan, which produce about 2,000 tons of sugar.

Mohéli, the smallest isle of the archipelago, possesses a fine sugar works, founded about 1882 by M. Lambert, Duc d' Emyrne. This is now the property of an Englishman.

Nossi-Bé also produces sugar. The fertility of the island is remarkable. Unfortunately the want of labour and of capital is a powerful obstacle to the development of agriculture. In 1887 there were only 2,150, acres cultivated by 605 hands, with 13 works and 15 distilleries. The principal cultivation, that of the cane, produced 433 tons of sugar, 25,280 gallons of rum, and 49,266 gallons of molasses.

The imports of French colonial sugar into France in 1878 were over 88,000 tons, or more than half the quantity of beet and cane sugars imported. In 1880, out of a total of 210,000 tons, our colonies only supplied 74,000 tons. Since that time the quantities have varied as follows :—

	French Colonies.	Total Imports of Sugar.
1880.....	74,659	210,774
1881.....	74,518	226,067
1882.....	92,106	238,520
1883.....	76,186	205,525
1884.....	73,930	220,536
1885.....	109,688	277,000
1886.....	98,013	159,836
1887.....	118,688	152,570
1888.....	119,700	189,600

The following is the distribution of the colonial imports of 1879 and 1888 :—

	1879.		1888.
Guadeloupe	29,347	....	46,611
Martinique	25,731	....	37,882
Réunion	28,093	....	32,133
Mayotte	4,750	....	2,860
Nossi-Bé	—	...	175
Cayenne .....	—	....	—
Other Possessions .....	—	....	5

THE DIFFUSION PROCESS.

The following details of the working of this process at the Cane Sugar Works, at Plantation Cugden, in New South Wales, will certainly interest our readers, especially those who may be intending to adopt this system. The plant in question was supplied by the Sangerhäuser Manufacturing Co., Sangerhausen (Germany):—

The diffusion plant supplied to us has given no trouble whatever, and the whole of the machinery worked to our entire satisfaction.

The cutter, with its horizontal cutting disc, answered its purpose very well, and we had no difficulty in feeding the cane into the feed hoppers, as this was being effected by an overhead carrier, on which the cane was thrown in the same manner as at the time when we worked with the mill.

We use the cutter knives 12 hours before re-sharpening them. However, this has to be done more frequently if the cane is of an inferior quality, and especially if it comes from the field with a large amount of roots and trash attached to it. Six hours may be fairly considered as the minimum length of time for which they can be used before they have to be replaced by another set.

The time occupied in changing knives occupies about five minutes.

The Stotz's patent chips elevator, which takes the chips up to the battery, works admirably. We can diffuse on an average seven diffusers per hour. This leaves about $8\frac{1}{2}$ minutes' interval between the emptying of two diffusers. The valves, heaters, covers, and bottom doors of the diffusers keep absolutely tight, and the manipulation of this machinery is exceedingly simple.

We had during the whole season an average dilution of the diffusion juice of 26.25 per cent., but we may mention here that since the beginning of this season we have already succeeded in reducing the dilution to 16.5 per cent. This has been effected by a new system of operating the battery.

The loss of sugar in the battery amounted to 0.44 per cent. on the weight of the cane. We determined this loss by deducting the amount of sugar by weight, which we found in the diffusion juice, from the amount of sugar by weight, which had actually been put into the battery with the fresh cane chips.

The diffusion juice was treated in the battery with carbonate of lime. We tried liming at first with ordinary quick lime. However, we soon found that this process involves heavy loss in sugar unless great attention is paid to its execution; for this reason we are now converting the lime into carbonate of lime before we add it to the fresh cane chips.

The carbonic acid pump ordered at the same time serves to draw the combustion gas from our wood furnaces in its passage through the chimney, and at the same time to pump it into the lime tank which is filled with ordinary milk of lime of 20 deg. Beaumé. Our chimney gases carry about from 10 to 12½ per cent of carbonic acid. The gas passes through a gas washer on its way from the chimney to the pump.

The diffusion juice when it comes from the battery is neutral, and resembles in colour and appearance Rhine wine; there is not a trace of flocculent or fibrous matter in it, as it has been well filtered through the cane chips on its way through the battery. The proportion of glucose to sucrose in the diffusion juice was the same as in the mill juice, no increase of the amount of glucose could ever be detected, though we were sometimes obliged to leave the juice in the battery some hours in consequence of a stoppage. Once we stopped the battery twelve hours without emptying it, and were very pleased in finding that the juice in the cells did not undergo any deterioration whatever. This we know now is entirely due to our new improved method of defecating in the battery.

The diffusion juice was taken direct to the triple effet without forming any excessive scale in the heating tubes, in fact we found this formation of scale to be even less than we had with the mill juice. The thin layer of scale which formed, consisted entirely of carbonate

of lime, which could easily be removed on Saturday night by boiling slightly acid water in each vessel of the triple effet for about thirty minutes ; no scraping of the tubes being required.

As we desire to turn out a better class of sugar for future sale in our local market, we are now sulphuring the juice after it comes from the battery, and with the object of securing a better result, we have recommended the use of Baur's filter-press, which commends itself to us as a machine well suited to the object in view, and it appears to us that a further improvement may be made by filtering the syrup through these presses, also before it is drawn into the vacuum pan.

The use of Baur's filter-presses would, we think, be very advisable even for making ordinary sugar for refineries, and we think that in this case the diffusion juice should be rapidly boiled up for some minutes after it comes from the battery, in order to coagulate even the last traces of albuminoids, and to convert bi-carbonate of lime, which may be kept in solution in the juice, into insoluble carbonate of lime. These insoluble particles could then easily be removed by the sand in the Baur's filter-presses.

We found that we obtained in the masse cuite 93.00 per cent. of the total sugar in the cane. This was the average of the whole season's work.

We intend to use the exhausted cane chips as manure for our cane fields ; our land contains rather little lime, and we prefer, therefore, to return the chips to the fields instead of burning them.

The triple effet and vacuum pan are doing us good service, and we consider especially the style of the triple effet superior to any other which we have seen in this colony. We find the arrangement as juice catchers, Hodek's safes, &c., provided for preventing the juice from boiling over, to be exceedingly practical and good.

The Burekhardt & Weiss dry vacuum pumps and air compressors, which latter is being used in connection with the diffusion battery, work smoothly and to our entire satisfaction.

As regards Bergreen's pug mill, and the small masse cuite boxes, supplied to us for this season's use, we have of course only been able to use them for a short time, but so far as we are able at this time to judge, we may predict for these also an unqualified success.

THE CULTIVATION OF THE OTAHEITE CANE IN GUADELOUPE.

The Guadeloupe Chamber of Agriculture has drawn up the following report, to be forwarded to the Chamber of Agriculture at St. Denis (Réunion), which had asked for information respecting the methods of planting and cultivation in use in the West Indian Island :—

The Otaheite cane is the one most generally cultivated in Guadeloupe, and has always been preferred. For some years, however, a sort of degeneration has been noticed in this cane, undoubtedly arising from the careless manner in which the plants have been chosen. In fact, those plants which were destined for the fresh plantations made during the time when cutting was suspended, viz., October, November, and December, were almost always taken from the worst plots. Worn out, diseased, and improperly cultivated canes can certainly be nothing but bad reproducers, and we should not have had to wait long before total ruin set in, had we not found a remedy for the evil.

For the last five years we have set ourselves to work to regenerate the good Otaheite cane by proper selection of plants, and are in a position to affirm that the minute attention which we have paid to this subject has already been largely rewarded. The head shoots and cuttings bud with a strength and a luxuriance which delight our planters, and give them cause to hope that before long the Otaheite cane will be completely regenerated.

The following is our mode of proceeding for these two kinds of planting. We make use of head-shoots and of shoots with two divisions of cane attached, after the leading shoot has been cut off. We confine ourselves to the two divisions, having noticed that the third produced defective buds, undoubtedly because it is less rich in sap than the two first.

The plants are always chosen from the best canes, *i.e.*, the first and second growths of planted canes. In order not to strip the plots, these are chosen from the outside of the plots, in the first row. The canes there are better developed, they stand thick on the stools, and supply plants infinitely superior to those growing inside; this fact is explained by the action of the sun and the air, and also by the larger space which these first rows have for their growth. We choose the best out of the eighteen or twenty canes of which the stools are generally com-

posed, taking about half; we commence by cutting off the heads of the plants, and, five or six days after this operation, the time for putting them in the ground is indicated by the sap flowing to the eyes and causing them to swell. The first plant is cut with a length of fourteen to sixteen inches, the next two cuttings (also of the same length), when the eyes have in their turn become swollen, the rest of the cane being cut down to the ground, taking care not to injure the other canes of the stool which are intended to be retained. The portions cut down are chopped small, and form a substantial fodder much appreciated by mules. The head-plants and likewise the cuttings are put into the ground, at an angle of fifteen to eighteen degrees, during the rainy season, viz., October, November, and December. It should be added that we only make use of the cuttings during this season. In January, February, and March, we only make use of the head-shoots, choosing them exclusively from the best canes, and being careful to leave for each shoot four or five joints previously deprived of their leaves, and the heads having also been cut off at a time when the eyes were not naturally swollen by the sap. During the dry season the eyes should not be allowed to become too large. At this time we plant *à la pince*, vertically, taking care to press the soil round the plants sufficiently close to intercept the action of the air, the plants not being less than sixteen inches long. If the ground has a clay sub-soil, as is the case with almost all the land in the Grande Terre, planting can be carried on during the greatest drought, for the plants almost always succeed. The lower part, which is in the clay, throws out roots which cause the eyes to germinate and keep up a certain amount of vegetation up to the time of the rain. Undoubtedly, however, if the drought lasted too long (which is rarely the case), the plants would finally succumb. We have spoken of plantings made as late as March. We have now no fear with regard to these plantings, which arrive at maturity in a good and healthy condition. The regular use of instruments for breaking up the ground, the free circulation of air permitted to the canes, the good manures supplied at the right time, the possibility of always getting the plants (which are to be obtained at this season in profusion and of the best type) to throw out shoots, are so many guarantees for obtaining excellent results. We have on many occasions observed that the canes of January, February, and March were the most healthy at the time of cutting, whilst those planted in October, November, and December were con-

siderably deficient in quantity because of the number that were spoiled. It is to be feared that many of those sent to the works are already diseased or beginning to rot; this is not perceived because the outside appears healthy. In our opinion the best manner of proceeding is to divide the plantings as follows:—As little as possible in October, somewhat more in November, and still more in December, January, and February, but little in March. We have said that a careful choice of plants is an essential condition for the improvement of the species, but we must add that a careful and intelligent cultivation contributes enormously to this improvement, more especially the use of good animal manure, and of artificial manures of the best description. But amongst the causes of the improvement which has taken place must be placed first of all the employment of cultivators which was introduced on a large scale five years ago by our eminent compatriot, Mr. E. Souques, to whom is owing the great advances made, and the present prosperity of Guadeloupe.

The plantings being made at a distance of about five feet in every direction, these valuable implements keep the soil in a constant state of looseness, and hinder the weeds from growing in the spaces.

The cultivated lots must have drains about every six or seven yards, especially on clay soils, where the filtration of the water cannot take place naturally in the sub-soil.

Last year we made a trial of plantings in rows, which gave very good results. We shall continue these this year in larger proportions. The width of the furrows is about two yards, the head-shoots and the cuttings are planted at a distance of three quarters of a yard. The *Haies* form quickly. One of the great advantages of this mode of planting is that it allows the canes to remain in better condition.

THE CONDITION OF BRITISH GUIANA IN 1888.

The following particulars of the economic and commercial condition of British Guiana in 1888 are extracted from the report in the Blue Book of the colony for that year:—

Revenue.—The colonial revenue for the year 1888 was £461,941, a decrease of £1,929 on the revenue of 1887.

Expenditure.—The total colonial expenditure amounted to £490,566, and exceeded the expenditure of 1887 by £1,351.

Public Works.—The expenditure on public works in 1888, defrayed

from current revenue, was £26,684, being £11,463 less than the expenditure during the preceding year. No new works of any importance were taken in hand.

Population.—The population of the colony is estimated to have increased from 277,038 on the 31st December, 1887, to 278,477 on 31st December, 1888.

Imports and Exports : Value of Imports.—The imports of 1888 were valued at £1,586,055, showing a decrease of £17,120 compared with the imports of 1887.

Value of Exports.—The total value of the exports was £2,024,733, being £165,859 less than in 1887.

The following figures show the diversion of the export trade from the United Kingdom to the United States :—

	1885.	1886.	1887.	1888.
United Kingdom. Per cent. of total exports..	71 ..	58 ..	52 ..	49
United States. Per cent. of total exports	17 ..	30 ..	37 ..	38

Shipping, as compared with the previous year, shows a decrease in the number of vessels entering the ports of the colony to the extent of 121, with a tonnage of 51,628.

Agriculture : Sugar Industry.—The area of land in sugar cultivation according to returns furnished 30th June, 1888, was 76,625 acres, a slight increase on the year before ; 4,314 acres were in plantains, and the remaining land occupied by the sugar plantations, but uncultivated, amounted to £76,581.

A further gratifying improvement in the value of the staple product of the colony has to be recorded.

From a value of £20 a hogshead in 1880, vacuum-pan sugar fell in 1886 to £11 4s. 7d. It rose to £13 11s. 4½d. in 1887, and in 1888 the average value was £15 8s. 7d.

The exports during the year were sugar, 120,135 hogsheads, valued at £1,606,690; rum, 14,073 puncheons, valued at £93,118; and molasses, 26,604 casks, valued at £73,604.

These are considerably less than the figures for 1887, except molasses; but in that year favourable seasons had helped to produce the largest crop ever made in the colony.

The exports of 1887 are given for comparison. Sugar, 149,860 hogsheads, valued at £1,798,637; rum, 24,829 puncheons, valued at £139,664; molasses, 19,019 casks, valued at £44,209.

WASHING IN CENTRIFUGALS.

A paper read by Mr. D. D. Colcock before the Louisiana Sugar Planters' Association, October 10th, 1889.

Especially in Louisiana is the sugar maker a maker of sugar. From the time the juice flows from the mill to the time the head goes into the barrel, *his* skill is the important factor in the year's venture. Under his eye the defecation, clarification, concentration, and purging, all proceed, and it is of this last process we are called upon to-night to speak.

While it is impossible to lay down arbitrary rules for purging, it is none the less proper to define certain limits beyond which unnecessary waste must occur.

With the *masse cuite* the process of cooking ends. This *masse cuite* is the true commercial product of the plantation. It is a mixture of crystals entangled with the noncrystallizable portion of the cane juice—each crystal being surrounded with the molasses, from which it must be separated. Two hundred pounds of the *masse cuite* are placed in the basket and form its charge. The basket spins, a wall of semi-solid stuff is formed upon the wire cloth, and by the centrifugal force, generated by the spinning of the basket, the fluid portion passes through the meshes. It is obvious that any application of a “wash” must act first upon the inner surface of the wall. Hence this inner surface is quite likely to part not only with the pellicle of adherent syrup and molasses, but also with a portion of the crystals therein. Nor must any wash be applied until the free molasses has been purged out, and the wall presents an homogeneous mass of *comparatively dry* crystals uniformly compacted. Here, then, are presented two matters for consideration: When to apply? and how much to apply?

The first is answered by the obvious necessity of giving sufficient time to the machine to do its *unaided* work. In other words, do not be in a hurry to put in your wash.

The second is not so easy to answer. The minimum that will clean the *outer* wall of the mass, after percolating through the whole thickness thereof, is what we desire to establish.

Speaking with several sugar makers on this topic, we find the rose pot objected to by all, and the rubber squirt or syringe, holding about one pint, preferred. About four to seven seems to be the number of squirts required.

Generally six are applied. These six pints of water are capable of holding in solution five and one-half pounds of sugar, and it is likely that two pounds of crystals at least *are* dissolved. Should nine pints be used another pound of sugar is dissolved. Now, for the sake of argument, assuming that the greater part of this dissolution occurs after the application of the first two squirts, which will have denuded the crystals of the greater part of the adherent pellicle, we think it fair to conclude that two pounds are dissolved in each 120 pounds dry sugar discharged, or on a crop of 1,200,000 pounds, 20,000 pounds of sugar are washed away, a value of \$1,200, or \$1 per 1,000 pounds, for their subsequent recovery even at reduced value is problematical. That this is no unimportant matter is proven by the recent process invented by Seyferth, at Waghaeusel in Germany, who practices the washing in centrifugal machines of the raw sugar before the melt is made, using paraffine oil as a wash with considerable profit. This process cannot well be applied in sugar houses on plantation, but by using a "clairce" or "white liquor" in lieu of water, after the first squirt or two, and running the syrup off separately for re-use, until too much discoloured, it might be possible to save this waste, or at least the greater portion of it, with very small expense for labour and material. At all events, the sugar maker who, by careful attention to the restrictions of washing water, obtains a greater amount of dry sugar from the charge of the centrifugal, should get credit for his care, and *per contra*, the sugar maker who gets "choice white" by lavish use of "wash" water should be discredited instead of being praised, as he often is by the unobservant proprietor. The same remark has its bearing upon the making of grey yellow clarified, which, though off in colour, is sought for by the refiner to such a degree that the margin of value between that grade and the choice yellow has become comparatively insignificant.

WILHELM HERBERTZ.

We regret to announce the rather sudden decease, on the 30th September, after a short illness, of the much respected editor of the *Deutsche Zuckerindustrie*, Mr. Wilhelm Herbertz, in the 69th year of his age. Up to the 26th ult. he had been actively engaged, as usual, in editing his well-known journal.

During the past few years, in which Germany has come so prominently to the front among the sugar-producing countries of Europe, we have had frequent occasion to admire the clear-sighted financial policy which the deceased gentleman has always fearlessly advocated, even when such advocacy might have seemed detrimental to the interests of his journal, as being opposed to the conservative and narrow views of his clients, the German beet growers and sugar manufacturers. It is a coincidence that on the very eve of his decease, we should have been hearing rumours of the possible eventual adoption of total abolition of the duty on the beets by the German Government, which would at once sweep away the obnoxious bounties—a measure which Mr. Herbertz had the foresight to advocate, some time back, as the only safe financial policy for the Fatherland on this question.

We fully share in the sentiments so well expressed by Mr. Jos. Görz (for many years collaborateur of Mr. Herbertz) in the *Telegraphische Correspondenz*, of which the following is a translation:—

“The loss which the industry has suffered by the departure of the deceased is a very heavy one. Even though his opinions as to the ways and means to be adopted in its further successful development were not always those of the greater part of the sugar producers, yet scarcely anyone has equalled him in persevering, devoted activity; in impartial thorough-going advocacy of the interests of the entire German industry.

“But the sad intelligence will produce a painful feeling even beyond the boundaries of our Fatherland, where men have learned to esteem very highly the unwearied activity of the deceased, evidenced in the publication founded by him—*Die Deutsche Zuckerindustrie*—which, by years of constant and ardent labour, he raised to the high and well-deserved position which it now enjoys.

“Honour to his memory! The gratitude of the German industry, which deplores the loss of a faithful champion of her interests, will follow him to the grave.”

FRENCH SUGAR LEGISLATION.

For convenience of reference, we give a resumé of the French Laws in relation to sugar, from, and including, 29th July, 1884.

LAW OF THE 29TH JULY, 1884.

ARTICLE 1.—The duties on sugars of whatever origin, and on glucoses of home production brought into consumption are fixed as follows, tenths and half-tenths included:—

Raw and refined sugars, 50frs. per 100 kilos. of refined sugar. Sugar candy, 53·50frs. per 100 kilos. of refined sugar. Glucoses, 10frs. per 100 kilos. of refined sugar.

In addition, the duties on substances derived from sugar are modified as follows:—

Molasses, other than for distillation, and having an absolute saccharine richness of 50%, 32frs. per 100 kilos. Chocolate, 93frs. per 100 kilos.

ARTICLE 2.—The duties on raw or refined sugars of whatever origin, employed in sweetening wines, ciders, and perries, before fermentation, are reduced to 20frs. per 100 kilos. of refined sugar.

A regulation of the public administration will determine beforehand the measures applicable to the use of these sugars.

ARTICLE 3.—Every manufacturer of home produced sugar may contract with the administration of indirect taxation for an *abonnement* in virtue of which the quantities of sugar liable to duty shall be assessed as regards the legal yield, according to the weight of the beetroots put into work.

This legal yield shall be definitive, whatever deficiency or overplus may ultimately arise.

This shall be based on the following conditions:—

	Yield per 100 kilos. of beets.
Diffusion, or any other analogous process	} 6 kilos. of refined sugar.
Continuous, or hydraulic process	
	5 kilos. of refined sugar.

The sugar, syrups, and molasses, obtained in excess of the legal yield, in the factories so assessed, shall be treated as sugar exempt from duty.

During the three campaigns, 1884-85, 1885-86, and 1886-87, factories not thus assessed shall be granted an allowance for waste of 8% on the total quantity manufactured.

The interests of the Treasury will be secured by a decree specifying the obligations which will be imposed on the manufacturers assessed.

ARTICLE 4.—Beginning from the 1st September, 1884, the quantities of sugar on which duty is to be levied shall be assessed in all factories according to the weight of beets put into work, whatever process may be employed for extracting the juice. The yields shall be fixed as follows per 100 kilos. of beets * :—

In 1887-88	6 kilos. 250 of refined sugar.
In 1888-89	6 kilos. 500 „ „
In 1889-90	6 kilos. 750 „ „
In 1890-91	7 kilos. „ „

ARTICLE 5.—The sugars of French colonies imported direct into France shall be granted an allowance for waste in manufacture of 12%.

ARTICLE 6.—Granulated sugars, or sugars in small crystals, whether agglomerated or not, will be received in discharge of accounts for temporary admission relating to raw sugars, to the extent of the amount of refined sugar which they shall be found to represent, when their net yield, ascertained according to the provisions of the law of 10th July, 1880, is at least 98%.

ARTICLE 7.—The complementary tax of 10frs. per 100 kilos. established by the first article, shall be applied to sugars of every kind already exempt from duties, as well as to materials in course of manufacture also exempt from existing duties, at the moment of the promulgation of the present law, in refineries, factories, or warehouses, or in any other places in possession of refiners, manufacturers, or merchants; the quantities shall be found by inventory; at the same time quantities not exceeding 1,000 kilos. of refined sugar shall not be subject to inventory.

ARTICLE 8.—Manufacturers and refiners will have to subscribe complementary agreements, guaranteeing the tax of 10frs. per 100 kilos. for sugars of every kind, and materials in course of manufacture, placed under the régime of temporary admission.

ARTICLE 9.—The minimum yield fixed by article 18 of the law of 19th July, 1880, shall be raised to 80% for sugars of European origin, or imported from European entrepôts.

ARTICLE 10.—Beginning from the promulgation of the present law and up to the 31st August, 1886, raw sugars and sugars not assimilated

* These bases were modified by the law of 14th July, 1887 (see further on).

lated to refined sugars, imported from European countries or European entrepôts, shall pay a surtax (not reimbursable) of 7 frs. per kilo.*

LAW OF THE 13TH JULY, 1886.

(Surtax and Equivalence.)

ARTICLE 1.—The surtax of 7 frs. on raw sugars, not assimilated to refined sugars, imported from European countries or from European entrepôts, which expires the 31st August, 1886, is prolonged until the 31st August, 1888.

ARTICLE 2.—Sugars exported from the French colonies, and destined for the mother country, shall have the right to an allowance for waste in manufacture equal to the mean amount of the quantities in excess of the legal yield obtained by the home manufacturers during the last campaign. By campaign is understood the period of manufacture comprised between the 1st September of each year and the 31st August of the succeeding year.

For the campaign of 1886-87, the allowance for waste in manufacture of 12 per cent. granted to the French colonies by the law of the 29th July, 1884, shall be raised to 24 per cent.

Only sugars which shall be officially certified at the port of embarkation before the 1st September, 1887, shall have right to be thus treated.

Decrees of the President of the Republic, issued on the report of the Minister of Marine and the Colonies, and of the Minister of Finance, will determine by what bureaux the sugars of the French colonies may be exported under reserve of the allowance for waste in manufacture.

Sugars of French colonies duly certified at the ports of embarkation may, after their arrival in the mother country, be re-exported abroad. Only the quantities representing the allowance for waste in manufacture must be landed; the surplus of the cargo may be re-exported after its existence on board has been verified.

Sugars exported through other bureaux than those fixed by the decrees of the President of the Republic will have a right to the allowance for waste in manufacture only on condition that they are disembarked at and certified in a bureau of the mother country.

Those interested will further have the option of having the examination of the sugars, exported by the bureaux indicated, suspended

* A law of the 13th July, 1886 (see further on), extended this surtax until 1888.

until arrival in the mother country, as has been previously pointed out.

ARTICLE 3.—In the colonies of Guadeloupe, Martinique, and Réunion, laboratories shall be established for analysing the sugars exported. These laboratories will be under the control of the Customs Administration of the mother country. The personnel will be appointed in accordance with the rules applicable to the municipal laboratories.

ARTICLE 4.—A decree of the President of the Republic, issued on the report of the Minister of Finance, will fix each year the sum which must be charged in the colonial budgets to cover the expense of the personnel and material of the laboratories, and to secure the application of the customs regulations in the bureaux open for the export of sugars.

The present law, deliberated on and adopted by the Senate and the Chamber of Deputies, shall be carried out as a law of the State.

LAW OF THE 27TH MAY, 1887.

(Augmentation of the Duty on Consumption.)

ARTICLE 1.—A temporary surtax of 20 per cent. is levied on sugars liable to duty of whatever origin, including raw, refined, or candid sugars which are declared for the sweetening of wines and ciders, and upon glucoses passing into consumption up to the 31st December, 1887. Up to the same date, the sugars exonerated from these taxes,—as being allowance for waste in manufacture or excess over the legal yield in virtue of the laws of 29th July, 1884, and 13th July, 1886,—are subjected to a special equivalent tax, payable at once on leaving the factories, or an importation from the colonies (10 frs. per 100 kilos. of refined sugar.)

Further, up to the same date, the duties on sugar derivatives enumerated hereafter, are modified as follows :—Molasses, other than for distillation, having an absolute saccharine content of 50 per cent. or less, 18 frs. per 100 kilos.; molasses, other than for distillation, having an absolute saccharine content of more than 50 per cent., 38 frs. 40 per 100 kilos.; chocolate, 98 frs. 40 per 100 kilos.

ARTICLE 2.—The new duty established by the preceding Article shall be applied to sugars of every kind exempt from duty or assimilated, as well as to materials in course of manufacture also exempt from duty, existing at the moment of promulgation of the present law in refineries, factories, warehouses, and other places, in the

possession of refiners, manufacturers, and merchants. The quantities shall be found by inventory, after declaration has been made by the holders.

All quantities not declared will be subject to a fine, in addition to the surtax, of double the amount of the surtax. Quantities not exceeding 50 kilos. of refined sugar are not subject to inventory.

ARTICLE 3.—Manufacturers and refiners will have to subscribe complementary agreements guaranteeing the surtax enacted by the present law, for sugars of every kind and materials in course of manufacture classed under the régime of temporary admission.

The settlement of these agreements will take place under the regulations laid down at the time when the laws of the 31st December, 1873, and 29th July, 1884, came into force.

ARTICLE 4.—Inventory shall be taken of sugars and syrups of every kind (with the exception of molasses) which shall be in existence in the refineries on the 1st January, 1888.

The refined sugars shall be taken at their integral weight, and candied sugars for 7 per cent. over. Other sugars and syrups in course of manufacture shall be estimated in refined sugar. This yield shall be calculated with the co-efficients of 4 for ash and 2 for glucose.

From the total amount of the inventory shall be deducted the quantities of refined sugar which have reference to the obligations of temporary admission not yet settled. The surplus will give a right to a restitution of 10 frs. per 100 kilos. of refined sugar.

The restitution shall be effected by means of inventory certificates, stating the sum which is claimable. These certificates shall be received for their value, before the 1st April, 1888, in payment of the ready money duties on sugars passing into consumption.

From the 16th December next, the employés of the Customs and the indirect contributions shall be admitted into the refineries at any hour of the day or night. They shall be able to survey the operations and make any examinations or preparatory inspections which they shall judge necessary. Those obligations of temporary admission which have not, at the time of the inventory, been represented by corresponding quantities of refined sugar or material in course of manufacture, can only be settled by means of certificates of export or of entry into entrepôt previous to the 1st January, 1888, or by the payment of the duty of 60frs. per 100 kilos. on the quantity of refined sugar assessed.

The present law, deliberated on and adopted by the Senate and the Chamber of Deputies, shall be carried out as a law of the State.

LAW OF THE 4TH JULY, 1887.

(Augmentation of the Legal Yield.)

ARTICLE 1.—The provisions of Article 4 of the law of 29th July, 1884, are modified as follows:—

Commencing with the 1st September, 1887, the legal yield per 100 kilos. of beets put into work in sugar factories shall be fixed as follows:—

Campaign of 1887-88	.....	7 kilos. of refined.
„ 1888-89	.....	7 kilos. 250 „
„ 1889-90	....	7 kilos. 500 „
„ 1890-91	.....	7 kilos. 750 „

ARTICLE 2.—The manufacturers whose works were already, at the moment of the promulgation of the law of 29th July, 1884, adapted so as to utilise the juice of the same beets in the simultaneous manufacture of sugar and alcohol, shall be maintained exceptionally under the system of ascertained production, and shall enjoy an allowance for waste in manufacture of 12%.

ARTICLE 3.—All infractions of the regulations of the present law, and of the provisions which shall be enacted for its carrying out, as also all contraventions of the former laws, shall be punished by the penalties provided by Article 3 of the law of 30th December, 1873.

Any contrivance with the object of falsifying the weighing apparatus, and causing deception as regards the weight of beets put into work, will involve, in addition, the payment of double duty on the quantities of sugar, which by such means may have been withdrawn from the legal yield from the commencement of the campaign, and of fourfold duty in case of a repetition of the offence.

ARTICLE 4.—A procès-verbal detailing a contravention of the prescriptions of the present law, which has been drawn up by only one agent of the indirect contributions, shall only be valid in law in the absence of proof to the contrary, in accordance with Articles 154 and following of the Code d'Instruction Criminelle.

ARTICLE 5.—From the time of the promulgation of the present law, raw sugars testing at least 65% and under 98% shall be received in discharge of accounts of temporary admission for the amount of their net yield, ascertained in accordance with the conditions fixed by

Article 18 of the law of 19th July, 1880, with deduction as allowed for waste of $11\frac{1}{2}\%$ of that yield.

ARTICLE 6.—Molasses having at least 44% of saccharine content, which are being sent to a distillery or exported abroad, shall be admitted in discharge on account of manufacturers who do not use the osmose process, at the rate of 14% of their weight.

ARTICLE 7.—To reimburse the Treasury for the excess of outlay, which may be rendered necessary by the application of the régime, instituted in favour of the sugar industry by the law of the 29th July, 1884, each *fabricant* will be required, dating from the 1st September next, to pay over to the principal receiver of indirect contributions, a quota the amount of which is fixed at 30 centimes per 1,000 kilos. of beets put into work. This quota shall be paid in three instalments, viz.: on the 31st December, on the third of the quantity registered up to that date; on the 31st March and the 31st May, at the rate of half the surplus.

- LAW OF THE 24TH JULY, 1888.

ARTICLE 1.—Commencing from the campaign of 1888-89, the duty on raw and refined sugars of whatever origin, fixed by the law of the 24th July, 1884, is reduced from 50 frs. to 40 frs. per 100 kilos. of refined sugar.

ARTICLE 2.—From the same date, a temporary surtax of 50 per cent. is levied on sugars liable to duty of whatever origin.

The sugars exempt from duty as being allowance for waste in manufacturing, or of excess over legal yield, in virtue of the laws of the 29th July, 1884, and the 4th July, 1887, are subjected to a special equivalent tax, payable in cash on leaving the factories (20 frs. per 100 kilos. of refined sugar).

Notwithstanding, all the excédents ascertained in the factories at work and arising from beetroots assessed and worked up during the campaign of 1887-88 shall remain subjected until the 31st December, 1888, to the regulations at present in force.

The surtax on colonial sugars exempt from duty as being allowance for waste in manufacture, is maintained at 10 frs. for the campaign 1888-89, in conformity with the regulations of the law of 13th July, 1886. Commencing from the 1st September, 1888, the surtax on sugars of this category shall be raised to 20 frs.

ARTICLE 3.—The duty on candied sugars, glucoses, sugars employed in sweetening wines, cider, and perry, and on sugar derivatives, shall

continue to be levied temporarily in conformity with the tariff fixed by the law of the 27th May, 1887.

ARTICLE 4.—The surtax of 7 frs. on raw sugars not assimilated to refined sugars imported from European countries or their entrepôts, which expires the 31st August, 1888, is prolonged until the 31st August, 1890.

The present law, deliberated on and adopted by the Senate and by the Chamber of Deputies, shall be carried out as a law of the State.

Supplementary Tax on Sugars employed in Sweetening Grapes.

ARTICLE 3 of the law of finances of 29th December, 1888, fixing the receipts and expenditure for 1888, runs as follows:—"To reimburse the Treasury for the extra expenditure which may be rendered necessary by the application of the régime instituted by Article 2 of the law of 29th July, 1884, each *dénatureur* of sugar shall be required to pay a quota the amount of which is fixed at 1 fr. per 100 kilos. of sugar put in work."

This quota is claimable from the 1st January, 1889; it is not calculated on the gross weight of the sugar put into work, but on the quantity which that sugar represents in the refined article. It raises to 25frs. the total duty on the sugars destined for sweetening grapes.

The Allowance on Colonial Sugars.

The Direction Générale des Douanes, issued on the 5th November, 1888, a circular, as follows:—

"In the terms of the first paragraph of Article 2 of the law of 13th July, 1886, the sugars of French colonies, sent to destination in the mother country, have a right, commencing from the campaign of 1887-88, to an allowance for waste in manufacture equal to the mean of the excess yield obtained by the home sugar industry during the preceding campaign.

"The average excédent obtained by the home sugar industry during the campaign of 1887-88 being 27·24%, this shall be the allowance for waste in manufacture to be granted to the sugars of French colonies sent thence to the mother country from the 1st September, 1888, and the 31st August, 1889, inclusive.

"The administration has decided that only the date of the departure of the ship carrying such sugar shall determine whether the latter comes under the old or the new allowance for waste in manufacture."

*Modification of the Regulations respecting
Raw Sugar for Export.*

In the sitting of the 16th March, 1888, the Chamber decided (Article 1 of the scheme proposed by the Commission, or Article 26 of the Law of Finances) that the provisions of Article 5 of the law of 4th of July, 1887, on the taxation of sugars, are applicable to the products dealt with by Article 6 of the law of 29th July, 1884, that is to say, the allowance of $1\frac{1}{2}\%$ is applicable to sugars, the yield of which shall be at least 98%.

The rapporteur général of the budget gave the following explanation of this Article 27 of the Law of Finances :—

“This article is intended to put an end to an anomaly at present existing in the method of estimating raw sugars admitted in discharge of accounts of temporary admission, according as the yield attains or does not attain 98% (Article 6 of the law of 29th July, 1884, and Article 5 of the law of 4th July, 1887). This anomaly was pointed out by M. Teisserenc de Bort, at the discussion in the Senate of the latter law, and the Minister of Finance undertook to introduce into the corrected budget of 1888 a regulation on this subject.”

To render clear this Article 26, which was adopted, the following are the Articles of the laws to which it refers.

LAW OF THE 29TH JULY, 1884, ARTICLE 6 :—

“Sugars in grain or in small crystals, agglomerated or not, will be received in discharge of accounts of the temporary admission of raw sugars, to the extent of the quantity of refined sugar which they shall be found to represent, when their net yield, ascertained in conformity with the provisions of the law of 19th July, 1880, which shall be at least 98%.”

LAW OF THE 4TH JULY, 1887, ARTICLE 1 :—

“Commencing from the promulgation of the present law, raw sugars testing at least 65% and under 98% shall be admitted in discharge of accounts of temporary admissions, according to their net yield, ascertained under the conditions fixed by Article 18 of the law of 19th July, 1880, with deduction, by way of allowance for waste of $1\frac{1}{2}\%$ of that yield.”

☞ The authors of the law of 1884 had desired to favour the development of the export of granulated sugars called *poudres blanches*. In fact, it is stated in the circular of the 17th August, 1884, issued by

the *Administration des Contributions Indirectes*, and commenting on this law:—Manufacturers and merchants will find in the new law (Article 6) a possibility of placing abroad, under the form of “white powdered,” not only the sugars corresponding to the excessive legal yield which are exempt from duty, but also the sugars sent out after payment of duty, whether from factories which are *abonnés* or otherwise.

The result of the modification adopted by the Chamber in its sitting of the 16th March, which came into operation on the 1st April, 1888, is that the allowance of the 1½% applies henceforth to all sugars, raw, white, and unclarified (*roux*).

JAMAICA EXHIBITION, 1890.

A largely attended and influential meeting, under the presidency of His Excellency the Governor, Sir Henry Blake, for the purpose of taking steps for an Exhibition in that Island in 1890, was held in the Jamaica Institute on the 19th of September. The following resolutions were passed:—

(1) Moved by the Rev. G. W. Downer, seconded by Mr. C. E. de Mercado:—

“That this the first meeting of the General Exhibition Committee, appointed by His Excellency the Governor, has heard with great pleasure the statement made by His Excellency in reference to the holding next year of an Exhibition of natural products, manufacturers of works of art, pledges itself to do all in its power to carry the scheme to a successful issue.”

(2) Moved by Dr. Pringle, seconded by Mr. G. Hicks:—

“That in order to carry out the proposal, an Executive Committee be appointed, and that this Committee consist of the following gentlemen, with power to add to their number”:—

Honourables Neale Porter, C.M.G.; Henry Hicks Hocking, Valentine G. Bell, C.E.; C. B. Mosse, C.B.; Thomas Capper, J. P. Clarke, C. S. Farquharson, Wellesley Bourke, T. L. Harvey, J. M. Farquharson, Robert Craig, W. B. Espeut, Michael Solomon, C. J. Ward, H. J. Kemble, George Stibel, John Pringle, M.D.; W. Ewen, W. H. Coke; Lord George Fitzgerald, Lieut. Kavanagh; James Allwood, George Turland, John Watson Taylor, J. W. Fisher, J. T. Wigham, James Harrison, Esqrs.; Right Rev. Enos Nuttall, D.D.; Right Rev. Charles Gordon, D.D.; William Fawcett, Esq.; Rev. George Downer; Maxwell Hall, Robert

Batten, G. N. Cox, A. C. Sinclair, J. C. Ford, J. J. Bowrey, Esqrs.; Rev. William Gillies; Jasper Cargill, Esq., M.D., Louis Verley, Esq., James Verley, Esq., Major Knollys, Alfred Pawsey, Esq., Captain Parkes, Captain Forwood, E. A. Haggart, Esq., Captain A. H. Pinnock, J.P., Captain William M. Bailey, Rev. W. Simms, H. W. Livingstone, Oscar Marescaux, W. E. Stavers, Rev. T. M. Geddes, Rev. D. J. East, Rev. James Cochrane, M. Solomon, Hon. W. Kerr, Hon. R. H. Jackson, H. Vendryes, F. Lyons, W. R. Macpherson, Geo. Solomon, Francis Dod, Esqrs.; Rev. J. Radcliffe, Dr. Plaxton, R. H. B. Hotchkin, Hon. Dr. Philippo, J. T. Palache, A. Winter, J. McLean, Hon. J. Orrett, William Morrison, Esq., G. J. deCordova, Esq., Charles E. deMercado, Esq., John Davidson, DeB. S. Heaven, Geo. Henderson, Wm. Malabre, L. F. McKinnon, Thos. Kemp, C. W. Treleven, Hiam Barrow, Esqrs.

(3) Moved by Capt. Parkes, seconded by Mr. William Morrison:—

“That the other West Indian Colonies be invited to send to the Exhibition such exhibits as will clearly indicate the great resources of these Colonies.”

To which the Hon. George Solomon proposed the following amendment, which was unanimously adopted:—

“That special exhibits be invited from England and other countries with which we trade.”

(4) Moved by the Hon. William Bourke, seconded by the Hon. George Henderson:—

“That in order to provide the necessary funds for carrying out the project in a thoroughly efficient manner, gentlemen of the Island shall be asked to become guarantors to the extent of £10 each and upwards.”

A wish was expressed that the minimum amount should be reduced to £5, which met with some support, but the original resolution was passed without alteration.

It will be seen from the foregoing that an interesting and useful feature of the Exhibition will be the display of the productions of other countries, and more especially of the other West India Islands. These are to be invited to send to the Exhibition such exhibits as will best show their resources and productions.

We hope the countries and colonies so invited to assist will respond promptly and fully, so as to make “the Jamaica Exhibition, 1890,” a complete success.

--- PRODUCTION OF SUGAR IN JAVA.

From the *Journal des Fabricants de Sucre*.

The exports of sugar from Java during the three last years were as follows:—

	1886.		1887.		1888.
	Tons.		Tons.		Tons.
To Europe	181,621	..	190,982	..	133,093
„ America	2,734	..	2,646	..	33,793
„ Australia	6,527	..	14,600	..	14,905
„ China	34,036	..	56,599	..	60,002
„ India	1,002	..	1,695	..	500
„ Singapore	11,369	..	10,328	..	7,907
	<u>227,489</u>	..	<u>286,850</u>	..	<u>250,200</u>

The crop of 1888 was considerably below that of the preceding year; the production was only 355,334 tons, against 375,784 in 1887, and 356,023 tons in 1886, including molasses. The deficit was most marked in the western and central provinces, and the falling off of the production is attributed to the *Sereh* disease. In the eastern portion of the island the crop was about the usual one; but the dry season and the use of better implements have enabled them to work more rapidly than usual. No opinion can as yet be formed with regard to the canes which have been obtained from Borneo, of which trial has been made for two years. The fields planted with these canes have produced on the whole abundantly, but as yet a sufficient quantity has not been crushed to enable planters to judge whether the quality is superior to that of the Java canes. Nearly the whole of the Borneo canes are used for new plantings. Statistics published by the Java Bank show that the cost of production of sugar has been considerably diminished; in 1885, No. 14 sugar cost 8 florins f.o.b., in 1886 7 $\frac{3}{4}$ florins, and in 1887 6 $\frac{3}{4}$ florins per picul. These prices are equal to 10s. 5d., 10s. 1d., and 8s. 7d., respectively. This diminution in the cost price is due to reduction of wages, the greater cheapness of the raw material, a more economical cultivation, reduced rent, and finally to the greater care in planting and the use of improved implements.

TABLE OF PERCENTAGE OF SUGAR OBTAINED FROM 100 KILOS OF
BEETS IN GERMANY FROM 1880-81 TO 1888-89.

	Percentage of Raw Sugar.	Percentage of Refined Sugar.
1880-81.. .. .	9.06	8.15
1881-82	9.92	8.92
1882-83.. .. .	9.71	8.74
1883-84	10.77	9.69
1884-85	11.02	9.91
1885-86	11.85	10.66
1886-87	12.32	11.08
1887-88	13.77	12.39
1888-89.. .. .	12.39	11.15

COST PRICE OF 1 CENTNER (110½lb.) OF RAW SUGAR AT THE GERMAN
SUGAR FACTORY OF CULMSEE FROM 1884-85 TO 1888-1889,
WITH PREMIUM OBTAINED BY THE MANUFACTURER.

	Cost of 1 Centner.	Premium.
	s. d.	s. d.
1884-85	8 3	2 11
1885-86.. .. .	10 1	2 2½
1886-87	8 6	1 8
1887-88	9 7½	1 4¾
1888-89	11 2	0 7½

SACCHARINE.

By a royal decree, dated 20th August, 1889, the introduction of saccharine into Portugal is forbidden. It will be allowed to import it for pharmaceutical purposes, but special permission must be obtained for each individual case, such saccharine to be subject to a duty of reis 15 \$000 per 100 kilos., equal to 34s. per cwt.

By a decree of the 1st October the Italian Government has prohibited the importation and manufacture of saccharine, or products sweetened with saccharine. It will be allowed to be used in pharmacy only.

It is understood that the use of saccharine in Italy has of late increased to a large extent, and as the duty was only 10 francs per kilo., there was a strong competition with sugar arising from its

employ, and a corresponding decrease in the Treasury receipts. It has been used in confectionery, and for syrups and other light drinks.

In Hungary the Government has received from the Commissioner of Public Health a report on saccharine, declaring that it is desirable and necessary that its use should be prohibited as regards articles of foods and condiments, inasmuch as it is not a sugar, possesses no nutritive properties, and in the long run causes disturbances of the digestion. Its use as a medicine might, however, be authorised.

DEATH OF MR. STAFFORD ALLEN.

Mr. Stafford Allen, a well-known member of the Society of Friends, died at his residence, Upper Clapton, on Monday, aged 83, after a short illness. With Mr. Allen disappears one of the few remaining links between the present and the old Abolitionist party, for he worked with Clarkson, Wilberforce, Brougham, Buxton, Joseph Sturge, and others for the abolition of slavery in the British dominions. Mr. Allen was a member of the old anti-slavery societies as far back as 1831. He sat upon the first committee of the existing British and Foreign Anti-Slavery Society when it was founded in 1839, being the only member of that body still upon the committee when it celebrated its jubilee in the present year. In commemoration of his long and useful connection with that society he was elected vice-president a few months ago, being the only person who has ever filled that office. His sympathy for the coloured races was so strong that some years ago he crossed the Atlantic in order to see for himself the condition of the enfranchised negroes in the United States. Mr. Stafford Allen was nephew of the well-known Quaker philanthropist, and chemist, William Allen, F.R.S. He was one of the delegates to the World's Convention, held in London in 1840, under the presidency of Thomas Clarkson. His portrait appears in the great picture of this Convention, painted by Haydon, and presented to the National Portrait Gallery by the Anti-Slavery Society. Of the large body of Abolitionists represented in that picture, it is believed that only the following now survive:—Sir Edward Baines, George William Alexander, William Morgan, and Mrs. Elizabeth Pease Nichol (widow of Professor Nichol, the astronomer, and daughter of Joseph Pease, the first Quaker member of Parliament).

BEETROOT SUGAR MANUFACTURE IN THE UNITED STATES.

COST OF WORKING AS COMPARED WITH GERMANY.

The following letter, addressed to the *Deutsche Zuckerindustrie*, contains some very interesting remarks and not altogether favourable criticisms on the results supposed to have been obtained in the Californian beet sugar factory. We therefore translate in full:—

In the communications respecting the sugar industry in cis-European countries, which are appended to the *Zeitschrift für Rubenzuckerindustrie* there are some very interesting particulars, given by Claus Spreckels, of the results of the first campaign in his beet sugar factory at Watsonville (Cal.). It may, therefore, be of interest to classify these results in the manner usually adopted in stating the results of the German factories. Unfortunately there are several evident contradictions in the statements made. Thus Spreckels at one time quotes the price of beets at \$5.32, and at another at \$5.04. Further, the average saccharine content of the beets is given in one place as 11½ per cent., in another 14.6 per cent. The average price of sugar is stated to be 5.64 cents per lb. English, but calculating from the figures given, it should be 4.95 cents. In spite of these discrepancies we can obtain a tolerably approximate idea of whether or not the beetroot sugar industry will pay.

In dealing with the figures given by Claus Spreckels we take one ton as equal to 2,000 lb. English, and 907.1 kilos., and the dollar as equal to 4.16 marks.

In the first campaign of the Watsonville factory, which lasted from the 20th October to the 20th December, 1888, 255,400 centner of beets were worked up, equal to about 4,400 centner in 24 hours. The average crop of beets was about 165 centner per Prussian *morgen*. The sum of M.295,593 was paid for beets = 115.74 pf. per centner. The quantity of sugar obtained was 29,753 centner of 95.4% polarisation = 11.65% of the beets. As the average saccharine content of the beets is several times stated as 11.75%, this yield can only be explained by the whole of the molasses having had the sugar extracted from them. We have to assume this, as no details are given of the quantity of molasses obtained.

The cost of the first campaign's working is then summed up in a regular form. But these figures only relate to the time that the

campaign actually lasted. In calculating the total net profits we must, therefore, take into account the not inconsiderable expenses of working outside of the actual campaign. Besides this, it seems as if all the items of outlay had not yet been brought into the statement of accounts.

We now give the cost of working of the Watsonville factory in a regular form, and add for comparison the cost of working in one campaign of a German factory of equal size using the Anoscsnidnip process.

	Marks.	At Watsonville.		At a German Factory.	
		Per Centner of Beets.		Per Centner of Beets.	
		Pfennig.		Pfennig.	
Wages	87,739	..	34.35	..	8.67
Coal	71,831	..	28.10	}	9.15
Wood	4,123	..	1.60		
Oil for Lighting..	47,240	..	18.48	..	—
Gas	—	..	—	..	0.88
Coke	6,901	..	2.70	..	0.45
Chalk	7,405	..	2.90	..	0.82
Lime	—	..	—	..	1.44
Press Cloths	—	..	—	..	1.48
Chemicals	52	..	0.02	..	0.55
Tallow	216	..	0.08	}	0.25
Lubricating Oil..	—	..	—		
Sundries	10,712	..	4.18	..	4.77
Carriage of Sugar	12,277	..	4.80	..	—
Sugar Sacks	7,238	..	2.82	..	—
	<u>255,734</u>		<u>100.03</u>		<u>28.46</u>

In the case of the German factory the items "carriage of sugar" and "sugar sacks" are wanting. If we deduct these from the total for Watsonville, we find the cost of working per centner of beets to be 92.41pf., or 64pf. higher than in Germany. Assuming that the total cost of maintenance and working for the whole year will be about one-half more, then the total cost per centner of beets at Watsonville is 138pf. against 42pf. in Germany. Even leaving out the correspondingly higher amount to be written off, because of the greater capital employed (M.1,660,000), the cost of working up 1 centner of beets in America is in round figures 90pf. more than in Germany.

This difference will be somewhat reduced in future years, as the

working of a new factory is always more expensive at the outset. But as this factory is provided with the newest appliances, a portion of them obtained from Germany, and as the operations are conducted according to the latest methods, the expenses will not be very much reduced. We shall, therefore, always be able to reckon that the cost of working in America is from 80 to 90pf. per centner of beets more than in Germany. With a yield of about 11% of sugar the cost of obtaining 1 centner of sugar is, therefore 7 to 8 marks greater.

The beetroot sugar industry of America is thus only able to exist so long as it is protected by the high customs duty, or so long as sugar obtained from the beet receives a bounty. Whether the farmers in America can continue to cultivate beets at the price of M.1.15 is a question which can only be answered by those having a knowledge of the circumstances over there. But it appears doubtful, in face of the fact that even in Germany, where labour is cheap, the beet cultivation is, in many districts, not regarded as paying at a lower price than 1 mark per centner.

INSECT PESTS.

By E. C. COTES, Assistant to the Indian Museum, Calcutta.

(1.) THE SUGAR CANE BORER MOTH.

Diatraea saccharalis, Fabr.

The larvæ of this moth bore into the stalks of sugar cane often thereby setting up putrefaction, so that the whole stalk becomes worthless.

It has not yet been satisfactorily determined whether the sugar cane borer, found in different parts of the world belongs exclusively to a single species, or whether there are several closely allied species, all of which damage sugar cane by boring into it. Until therefore this question has been definitely settled the Fabrician name of *saccharalis* may continue to be applied to the pest wherever it occurs, and the insect may be determined zoologically as a Pyralid moth, belonging to the genus *Diatraea* and to the species *saccharalis* of Fabricius.

Sugar cane, in different parts of the world has, for at least the last hundred years, been known to be subject to the attack, either of this pest or of others so closely allied to it as to be scarcely distinguishable from it, and during the last year information has been sent to the Museum of damage done to sugar cane in several parts of India,

where the pest would seem to have long been known, though but little has been recorded concerning it.

In 1857 Baboo Joykissen Mookerjee described the total destruction, by the pest which he calls "*dhosah*," of an imported variety of sugar cane (known as the Bombay or the red sugar cane) in the districts of Rungpore, Hooghly, and a portion of Burdwan. The cultivation of this variety had been carried on for some years, and had proved very profitable, but when the pest appeared its cultivation had to be entirely given up, as it was found to be very much more subject to attack than the country varieties of cane.

In the Indian Museum are specimens of the pest which were received in 1885, with the information that the insect had done great injury to sugar cane in Dhulia.

In 1888, the personal Assistant to the Director of Land Records and Agriculture, North-Western Provinces, wrote that the pest, which appears in dry seasons, had destroyed as much as a fourth of the sugar cane crop in the neighbourhood of the Cawnpore Experimental Farm.

The Special Manager of the Dhaukora Wards Estate writes that the pest, which is known locally as *Mandrauah*, has this year (1888) done injury to the sugar cane crops in several parts of the estate.

The Collector of Ganjam also notices injury done by this insect, which is known as *Monjikila purugu*.

The Agricultural Officer of Burdwan and Seebpore, writes that the loss occasioned by the pest, sometimes amounts to fully one-fourth of the cane crops of a neighbourhood.

With regard to injury by the pest in other parts of the world:—

In the year 1750 Hughes mentions injury done to the cane in Barbadoes by the larvæ of small moths which are likely to have been the same as the borer.

Porter notices that the pest was found fatally destructive in Guadeloupe in 1785 and 1786.

Beckford notices the presence of the borer in Jamaica in 1790.

In 1828 the Rev. L. Guilding wrote an account of the borer in St. Vincent, describing it as *Diatraea sacchari*.

Westwood mentions the pest as destructive to sugar cane in Jamaica in 1841.

About the year 1856 the insect did great damage to cane in

Mauritius, into which island it was supposed to have been introduced from Ceylon.

In 1857 the borers were very abundant along the Lower Mississippi in the United States.

About the year 1879 the borer did great damage to the sugar cane crop in British Guiana.

In 1880 Dr. Riley reported on the insect as injurious in the United States.

In 1885 Mr. H. Ling Roth described the insect as occasionally very destructive to sugar cane in Queensland, Australia.

The Agricultural Officer of Burdwan and Seebore writes—

“The sugar cane planting season extends from the beginning of February to the end of May. If there be no rains* in April or May, and if the cane fields are not frequently irrigated, which from the scarcity of water at this time, is hardly possible, the pest makes its appearance. The pest first shows itself by the drying of the middle stalk of the plant, and is hence called by the ryots the *Majera* (a Bengalee term meaning relating to the middle); on pulling, the stalk now easily comes out, and its lower end is found to have become a rotten mass. Very soon the whole plant dies away, and from the root stock a number of smaller plants make their appearance to be in their turn attacked by the worm. If the rains hold off a long time, or if the fields are not thoroughly irrigated, three or four generations of plants are in this way attacked and destroyed. At last, when the rains set in, the fields become free from the insect, and a number of sickly-looking cane plants shoot out, but these make very little progress and never attain the proper size of the cane plant. If only one generation of plants is lost, and if this happens at an early stage of the growth of the plant, the damage done is not much.”

The life history of the insect has not yet been fully studied in India, but what has been observed agrees so closely with the observations made on the corresponding sugar cane pests of other parts of the world, that we may safely infer the rest, and the following account therefore is taken from Dr. Riley's paper on the pest in America, where, however the insect is likely to take rather longer to pass through the various stages of its existence than in the warm climate of India.

* It is noticeable that while considerable injury by the pest is almost universally supposed to take place only when moisture is deficient, Ling Roth, in his account of the pest in Australia notices particularly that the pest occurs in “wet springs.”

The parent moth lays her eggs upon the leaves of the young cane near the axils, and the young borer, hatching in the course of a few days, penetrates the stalk at or near the joint, and commences to tunnel through the soft pith. The eggs are flat and circular, one twenty-fifth of an inch in diameter, and are white when first deposited, turning yellow as they approach the hatching point. The growth of the borer worm must be very rapid, less than thirty days being probably occupied in the larval state. The borers are quite active and occasionally leave their burrows and crawl about upon the outside of the stalk, seeking another place to enter. The full-grown borer is about an inch long, rather slender, nearly cylindrical, and cream white in general colour, but speckled with black spots, with a yellow head and black mouth-parts. Upon attaining its full size, it bores to the outside of the cane and makes a large round hole for its future exit—a hole which is usually at least one-fifth of an inch in diameter. It then retires into its burrow and transforms a short distance from the opening into a slender brown pupa* three-quarters of an inch long. The pupa state lasts but a few days, and then the moth makes its exit. The moth has a spread of wings of about an inch and a quarter, and is of light, greyish-brown colour. With the female moth the hind wings are of nearly the same colour with the fore wings, but with the male the former are silvery white. There are several broods in the course of the season, and the insects hibernate almost exclusive in the larval or “worm” state. During the winter they are to be found most abundantly in the seed cane, but also in the discarded tops, and to a slighter extent in the stubble.

The Agricultural Officer of Burdwan and Seebpore notices that he has seen the Kash plant (*Saccharum spontaneum*) attack by the insect in the same way as sugar cane is attacked. Specimens of what appear to be the larvæ of the sugar cane borer have been received from the Collector of Ganjam, who writes that they destroy paddy and brinjal plants, besides sugar cane. Similar specimens have also been received from the Agricultural Officer of Ranchi, who reports them as injurious to brinjal; and from Mr. Woodrow, of Poona, where they bore into jowari stalks, and are said to make the plant poisonous to cattle. Dr.

* The insect which damaged sugar cane in Mauritius about the year 1856, is said (see Bojer's Report) to have spun itself up in the leaves of the plant, instead of transforming into a pupa in its burrow. In the case, however, of the insects reared in the Museum, the pupæ were formed in the burrows in the cane.

Riley notices a very closely allied, if not identical, insect that bores into corn (maize) stalks in America.

In British Guiana the pest is subject to the attack of ants which live in the cane fields, and are supposed to wage continual warfare against the borers; and in Mauritius the chrysalids of the borer were found to be subject to the attack of mites; no evidence has yet been obtained of any effect produced in either of these ways upon the numbers of the sugar cane pest in India, though the writer has observed large numbers of a chaloid fly which is parasitic upon the allied or identical jowaree borer.

A large number of remedies have been proposed for the pest, and it seems to be pretty well established that it can be to a great extent controlled by the burning or burying all the discarded tops, and clearing the fields of all waste sugar cane stalks after the crop has been taken; for, as the insect passes the winter as a larva inside the sugar cane, if these are destroyed, there are no moths in the spring to lay the eggs which produce the next year's "borers." The waste tops, however, should be carefully gathered together and removed from the field before being burnt, for if they are burnt carelessly on the field itself, many predacious insects will be liable to be destroyed, which take shelter in the ground, and assist in reducing the numbers of the pest.

The following may be noticed among the remedies that have been suggested:—

Guinding recommends that all the dry and useless leaves, under which he says the moth lays its eggs, should be stripped off: he claims that this treatment has been found effective in removing the pest.

Porter quotes the practice of "introducing a pinch of quicklime into the heart of the young cane" for the destruction of the pest.

Westwood notices that in Jamaica, in 1841, the ravages of the borer were to a great extent checked by allowing the refuse to accumulate upon the grounds, and burning them there, the old roots subsequently throwing up more vigorous shoots.

Miss Ormerod, in writing of the pest in New Guinea about the year 1879, quotes the practice of cutting back the cane below the surface of the ground, covering the plant with mould, and adding a handful of lime. The cutting out of the affected canes was tried on one

estate over 246 acres, the result being considered satisfactory. In this case, the canes cut out were put through the mill, and sufficient rum and inegus obtained from them to pay expenses. Miss Ormerod also quotes the practice of steeping the cane for 48 hours in water before planting it, a treatment which was thought on one plantation where it was tried, to destroy the hybernating larvæ without injury to the cane. It appears from the enquiries instituted in British Guiana, that it is a mistake to burn the refuse sugar cane on the fields themselves, as this destroys the ants, which, when unmolested rendered valuable assistance in keeping down the pest. The plan therefore approved was to burn the refuse cane after collecting it in heaps, outside the fields.

Dr. Riley recommends burning all "tops" during the winter, so as to destroy the larvæ which hybernate in them; selecting seed cane from the least infested portion of the plantation, and laying it down in furrows during the winter, covered with earth as deeply as should be found possible without inducing decay, and only uncovering it as it is wanted in the spring for planting out, thus preventing the egress of moths from the larvæ which have hybernated in the seed cane.

Roth writes that "he has kept the pest under control in Queensland by sending boys with sharp pocket-knives along the rows of cane. The boys spotted the dead or dying shoots, and cut them off as close as possible to the parent cutting. They then opened the shoot and destroyed the fat grub. In some cases, however, the grub had migrated to a fresh shoot which as yet did not show any signs of decay, and thus escaped." Roth adds that "while dirty fields were being destroyed wholesale by the grub, clean fields were not infected to any such extent."

(2.) THE SORGHUM-BORER.

Mr. G. Marshall Woodrow, of Poona, has forwarded some stalks of *Sorghum vulgare* (Great Millet, *jowaree* or *juar*) injured by an insect which is said to be very destructive in the Deccan, and is believed by the ryots to be poisonous to cattle. In the account of *Sorghum vulgare* in "Field and Garden Crops," page 27, Duthie and Fuller write:—

"The most peculiar disease to which *juar* is liable is that which makes the young stalks poisonous to cattle if eaten by them when semi-parched from want of rain. Of this fact there can be no doubt;

in the scarcity of 1877 large numbers of cattle were known to perish from this cause, their bodies becoming inflated after a meal of the young juar plants, and death ensuing shortly afterwards, apparently in severe pain. A good explanation is not, however, forthcoming. The opinion universally accepted by natives is that young juar, when suffering from deficiency of rain, becomes infested with an insect called *bhaunri*, to which its poisonous effect on cattle is due. Immediately rain falls the insect is said to perish, and unless the ears have appeared before the rain failed, the crop often recovers itself and yields a good outturn of grain."

The juar stalks were in a rotten condition when received in the Museum, but they were found to be tunnelled by a caterpillar, much in the way that sugar cane is tunnelled by the sugar cane borer, *Diatraea saccharalis* (see page 22). The remains of the caterpillar, chrysalis; and imago of a small moth were also found amongst the stalks, but they were all in much too bad condition to determine definitely; as far as could be made out, however, they were very similar to the sugar cane borer. In this connection it may be noticed that the sugar cane insect occurs in dry weather, the plants recovering, if not already too far gone when rain falls, just as Duthie and Fuller describe to be the case with the juar plants. The sugar cane borer sets up putrefaction in the sugar cane stalk, and it is not improbable but that the juar insect may have a similar effect on the juar stalk, thus rendering them hurtful to cattle. The matter would seem to be of considerable interest. It is hoped, therefore, that better specimens of the insect, in all stages of development, may be sent to the Museum for comparison with the sugar cane insect.

Since the above was written further specimens of the affected *sorghum* shoots have been received from Mr. Woodrow. These were found to be tunnelled, and the base of the top shoots had become rotten and infested with dipterous larvæ precisely as is the case with sugar cane attacked by the borer moth. On comparing the boring caterpillars taken from the *sorghum* shoots with spirit specimens of the larvæ of the sugar cane moth the two were found very similar general size, coloration, and markings. There were, however, a few minor points in the markings in which they were slightly different from each other.

THE MEANS OF IMPROVING THE QUALITY AND
REDUCING THE COST OF SUGAR RAISED BY
FREE LABOUR IN THE EAST INDIES.

Being the substance of a Report handed in to the Directors of the Hon. East India Company, in 1824.

The main disadvantage under which the East India sugar trade labours, appears to be the very great imperfection and consequent expense of the mode in which it is manufactured by the natives of India.

A simple statement of that mode will at once show its defects, and must satisfy all who are acquainted with the process by which sugar is manufactured in the West Indies, that much would be gained by the substitution of the West Indian process for that which is now in use.

The East Indian method is as follows :—

When the canes are ripe, the ryot or farmer has them cut. Their juice is then expressed by means of a feeble machine, which is in general so tedious in its operation that time is allowed for the cane juice to ferment, a circumstance which necessarily proves injurious to the quality of the sugar. After the juice is expressed, it is boiled down by the ryot into one entire and heterogeneous mass called goor. Scarcely any attempt is made by him to cleanse or clarify it, or to make it granulate, and none to separate the sugar from the molasses. The whole forms one black and unsightly mass of concentrated cane juice with all its impurities; and in this state it is kept, sometimes for months, until it can be taken to market and sold to the sugar manufacturers. When the sugar manufacturers therefore purchase this goor, they are under the necessity of re-dissolving it in water before they can even commence their sugar-making process. Having thus brought the mass again into a perfectly liquid state, they proceed to boil it down to the consistency of sugar, clarifying it, and at the same time neutralizing the acid it may contain by large infusions of vegetable alkali. They afterwards separate the molasses from it by means which are unnecessarily operose.

Now in this mode of proceeding there are several very obvious and material disadvantages.

In the first place it is attended with a great and most uncalled for waste of labour and fuel. The first business of the sugar manufacturer is actually to undo all that the ryot has previously done, to reduce the goor again to the state of juice, and then to evaporate it a

second time. But even this needless expense of labour and fuel amounting to at least double what is requisite, is of less consequence than other errors in the process which tend to impair the grain and strength of the sugar.

It is well-known to West Indian planters, that if the juice of the cane is allowed to ferment, which it begins to do soon after the cane is cut, the acid which is thus generated is apt to prevent the sugar from granulating, and to injure its quality. The purest cane juice, however promptly expressed, can remain but a very short time in the receiver, before fermentation begins to take place (both Bryan Edwards and Roughley, in their account of Jamaica, limit the time during which it can remain after expression, without fermenting, to twenty minutes). To obviate this effect, the expression of the juice in the West Indies is conducted with the utmost celerity; and the interval between its expression and its being boiled is also as short as possible. Whatever acid it may contract during that brief interval, is neutralized by means of lime, the precise quantity of it which is adequate to that purpose having been previously ascertained by an easy process. If the cane juice is fresh, from two to four ounces of the lime is sufficient for one hundred gallons of the liquor.

The natives in the East Indies possess at present no machinery which will grind the canes with sufficient rapidity. The expressed juice is frequently, therefore allowed to remain an injurious length of time before it is boiled down into goor. They nevertheless employ on this occasion, no means of neutralizing the acid which must have been generated. The consequence is that the sugar does not granulate properly, nor is the dirt or the molasses separated from it, and it forms, as it becomes solid, a mixed mass of sugar and molasses, combining all the various impurities which belong to it naturally, or which it may have contracted in the process. No subsequent attention can perhaps adequately repair this disadvantage, which is further enhanced by the fermentation it undergoes while it remains in the state of goor, and the generation of additional quantities of acid. Much waste is also the necessary consequence of such a process. The sugar manufacturers of India, when they re-dissolve the goor for the purpose of making it into sugar, are obliged therefore to get rid of the acid it has contracted; and this they attempt to remove by means (as has been stated) of large infusions of vegetable alkali. But unhappily this substance which is employed to neutralize the acid, tends to diminish the sweetness of the sugar, and also to

injure its grain. The crystals are more soluble, and consequently do not form so readily, nor are they so large. They are moreover apt to be deliquescent and to attract moisture from the atmosphere. The result of the whole is not only that the expense of the manufacture is at least doubled, but that the sugar produced is often inferior in strength and grain to that which is imported from the West Indies. A mere statement of the process of sugar-making in the West Indies would enable a West Indian infallibly to predict this result.

Until the mode of manufacture therefore is changed, supposing the present difference of duty to continue, the produce of Bengal must labour under many disadvantages in its competition with the produce of the West Indies. The unnecessary expense and waste of the process, and the injury done to the article, will in some measure counterbalance the extraordinary cheapness of labour both in the cultivation of the cane and the manufacture of the sugar. It is evident, moreover, that the requisite improvement can only be effected by European skill and capital. The natives have neither the knowledge nor the means required for improving the process; and the machinery which could be established by Europeans without difficulty, and with a certainty of large profits, is not likely to be erected in the first instance by the natives.

The plan of proceeding would be simple. Sugar works must be formed in different parts of those districts where the sugar cane is chiefly produced. The conductors of these works must purchase the cane from the natives, grind it and boil it into sugar in the same manner as in the West Indies. The business of cultivation will thus still remain in the hands of the natives, and the process of manufacturing the cane into sugar will alone be undertaken by the Europeans. As it is absolutely necessary that the cane should be ground and the juice boiled into sugar very soon after it is cut, each establishment could embrace but a small district; such a district, however, as might be adequate to the production of from 250 to 500 tons of sugar per annum, the later quantity being probably quite as large as any one set of sugar works could manufacture. The produce of a bigah of land, which is equal to 1,600 square yards, may be taken at a moderate estimate at $3\frac{1}{2}$ maunds of 82lbs. weight, or 287lbs. of clayed sugar. (The proportion of clayed sugar to goor being as 7 to 24, this will give $3\frac{1}{2}$ maunds of clayed sugar. Most of the statements assign a larger amount of produce).

(To be continued.)

MONTHLY LIST OF PATENTS.

Communicated by Mr. W. P. THOMPSON, C.E., F.C.S., M.I.M.E.,
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ENGLISH.

APPLICATIONS.

14864. C. W. GUY, London. *Improvements in and relating to crushing mills.* 20th September, 1889.

14940. W. T. CROOKE, 235, Ivydale Road, Nunhead. *Improvements in pockets or bags employed in the manufacture of sugar and like substances, together with an improved process for cleansing the same.* 23rd September, 1889.

15992. E. KERSHAW and W. W. KERSHAW, Halifax. *A new, or improved, machine or apparatus to be used in making up for sale packets of tea, coffee, sugar, and other dry substances.* 11th October, 1889.

16066. G. R. BARROW, Bath. *Cutting rock varieties for confectioners and sugar boilers, viz., rock-cutting machine.* 12th October, 1889.

ABRIDGMENTS.

11729. J. E. HATTON, of Calle Consha, Fandicion, No. 1, Colon, Island of Cuba, Gentleman. *Improvements in sugar cane mills.* July 23rd, 1889. According to this invention the three rollers of the mill are so located relatively to one another that the cane, after undergoing the first crushing, drops naturally into place for the second, thus avoiding the use of the ordinary bridge or knife. Another improvement consists in the main frames of the machine being used only to support the rollers, the requisite pressure being obtained by means of two or four "yoke frames," that is, frames which embrace the journals of the rollers and by means of which the pressure may be regulated. These frames may be easily and cheaply renewed in cases of strain or breakage, and obviate the necessity of constantly repairing the main frames themselves.

AMERICAN.

ABRIDGMENTS.

410942. CARL STEFFEN, of Vienna, Austro-Hungary. *Centrifugal machine.* September 10th, 1889. A number of hollow forms or cones are placed radially in the cage of the machine, their broad open ends abutting against the outer wall thereof. Hot air for drying purposes may be admitted through a suitable opening in the apex of each cone.

411011. A. CHAPMAN, of Liverpool, England. *Evaporating apparatus*. September 17th, 1889. The outlet from an evaporating pan, instead of being in direct communication with the part of the pan which is below the steam drum, is in communication with the space which is above the drum, so that no liquid can reach the outlet without first passing up through the tubes in the drum. A good circulation is thus obtained.

411012. A. CHAPMAN, of Liverpool, England. *Vacuum evaporating apparatus*. September 17th, 1889. The patentee gets rid of the water of evaporation by means of a system of "inverted syphons."

411112. M. STEVENSON, of Fort Scott, Kansas, U.S.A. *Defecating pan*. 17th September, 1889. A flat pan is employed, divided longitudinally into three passages by low division plates. The juice passes up the side channels and back again along the centre, on reaching the latter end of which it is boiling, owing to the heat imparted from a series of steam pipes. The scum rises over the partitions and is removed.

412088. L. F. HAULTMAN, of New Orleans, Louisiana. *Steam heating coil*. October 1st, 1889. A coil constructed in accordance with this invention consists of a main pipe of taper form wound in a spiral involute, and this pipe has on its inner surface several branches of a corresponding curve also tapered and leading one into another until all rejoin at the common outlet at the centre. The inventor states that a very uniform and economical action is obtained with this coil.

GERMAN.

ABRIDGMENTS.

46958. A. STUMMER, Vienna. *Process and apparatus for casing sugar*. 17th July, 1888. In this process several boxes open top and bottom and charged with the stiffened sugar mass are placed with their open sides one on top of the other. Cleare is then passed through this box-like column, the uppermost box removed and a fresh one placed at the opposite end. The box column rests in this apparatus upon a table which is raised by the thrust rods of a hydraulic press, and with the box column is pressed against the upper abutment through which the cleare flows under pressure, while the syrup is discharged through a pipe and the movable table. Catches which engages flanges in the boxes serve to support the column during the removal and replacing of the boxes. For the purpose of automatically cutting off the flow of cleare when necessary, a shut-

off valve is combined with a receiving vessel for the discharged liquid which is suspended on a lever with a counterpoise, which vessel falls as soon as the necessary quantity of clear is required for covering the sugar mass has penetrated the column of boxes.

47386. T. DSCHENFZIG, Magdeburg. *Improved process for reducing Barium saccharate by means of carbonic acid with the aid of calcium bicarbonate.* (Addition to Patent No. 45376. 6th September, 1887.) 30th November, 1888. The barium saccharate is not as described in the principal patent resolved or suspended in water, but in raw syrup in order to partly decompose the sulphate and organic acids contained in the latter, a saving in carbonic acid being thus effected. Otherwise the process described in the principal patent remains unchanged.

47437. H. MIKOLECKY, Pilsen. *Spiral screw press.* 1st November, 1888. This screw press consists of several conical pressure chambers in which conical spiral screws move, and which are connected together by chambers of larger cross section than the end of the preceding screws.

47424. J. H. F. SCHULTZ, Hamburg. *Improved filter.* November 9th, 1888. In this filter a large number of vertical filter plates with socketed joint pieces are fixed over a common discharge pipe. The filter plates themselves are provided on both sides with vertical grooves, and on the top with an opening which serves as a collecting drain, and is in connection with the discharge pipe. The plates are covered with a woven material, upon which a fibrous material such as asbestos, cellulose, or the like is placed, the fibrous material which is engaged in gathering up the sediment in the water being allowed to pass away underneath the sieve. In order to impart a circular movement to the fibrous material to the one side or the other, a distributing plate is placed over the discharge pipe in the bottom of the apparatus. This plate can be raised by means of a handle fixed in the stuffing box. When the surface of the filter has become useless a scraping arrangement is brought into action, which is connected with the neighbouring filtering surfaces by iron plates. A sieve keeps back the coarse impurities which would otherwise flow through the pipe to the liquid being filtered.

48145. A. V. RITTER, Skriwan, near Neubydschor, Bohemia. *Process for forming sugar into blocks of any shape by the dry method.* 9th November, 1888. The process consists in filling shapes impermeable to damp, during the process of centrifugalling, with loose moist sugar of the required degree of purification, and which is

capable of being formed into powdered or fine grained sugar, or is intimately mixed with the same. This is centrifugalled until the mass acquires the necessary consistency and thickness. Thus by means of the coalescence of the grains of sugar and the hardening of the sugar blocks, the sugar dries and a refined product is the result, fit for the market.

BELGIAN.

ABRIDGMENTS.

75636. J. A. CEULEN, Brussels. *Improved apparatus for drying and rendering the scrapings of the sugar cane serviceable as fuel.* December 18th, 1886. The apparatus consists of a furnace formed of a number of earthenware or metal pipes, enamelled inside, and having a round, oval, or rectangular section, but with an opening larger below than above, in order to allow the easy descent of the husks to be dried, and to prevent their adherence to the interior of the pipes. The number and dimensions of these pipes vary according to the quantity of material to be treated. Each of these pipes is made of one or more lengths, according to the height of the furnace used, and is divided into two by another rectangular pipe, closed below, and provided with lateral openings, pierced obliquely with reference to the surface of the pipe, and rising again towards the interior. These openings serve for the escape of steam by the central pipe. All these pipes for the escape of steam are joined at their upper part by metallic or earthenware passages, which are themselves united in a general passage with a ventilator at the end, for the purpose of carrying off the steam to any condenser, and utilizing the water resulting from the condensation.

75229. MALLIAR, LAMBLLOT, and MALLIAR, Brussels. *Improvements in the extraction of sugar from molasses and saccharine juices, called division.* 13th November, 1886. The inventors claim that their method is new in so far that they claim a new application of a well-known method (the principle of division) for obtaining an industrial result. This operation, which takes place without any apparent movement, is effected with the aid of heat. The vessels being heated from below, the liquids contained therein receive an ascending and descending movement, the action of the heat crystallising at the same time the saccharine molecules, and dissolving the salts.

Patentees of Inventions connected with the production, manufacture, and refining of sugar will find *The Sugar Cane* the best medium for their advertisements.

ESTIMATE OF THE PRINCIPAL CANE CROP EXPORTS.

As customary, this month we give our first estimate of the exports of the coming Cane crops. They, however, must be taken with all reserve, as the outturn of most of these crops depends greatly upon the weather prevailing for the next three months, and also upon the prices ruling when Sugar making commences.

	1889-90.	1888-89.	1887-88.	1886-87.	1885-86.	1884-85.	1883-84.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Cuba	650,000	520,000	610,000	608,900	705,400	630,800	560,900
Porto Rico	70,000	60,000	60,000	86,000	64,000	70,000	98,600
Trinidad	55,000	55,000	60,000	69,000	49,200	65,700	59,800
Barbados	60,000	58,000	60,000	65,000	44,000	60,700	56,000
Jamaica	30,000	28,000	30,000	21,000	17,000	25,000	29,500
Antigua and St. Kitt's	28,000	25,000	26,000	25,000	25,000	20,000	23,000
Marfanique	40,000	38,000	39,000	41,000	33,000	38,800	49,400
Guadeloupe	50,000	45,000	50,000	55,000	37,000	41,200	55,300
Demerara	115,000	115,000	110,000	135,000	111,800	96,000	126,000
Reunion	23,000	25,000	32,000	32,000	35,000	36,500	37,800
Mauritius	125,000	132,000	120,000	101,800	114,200	128,000	120,400
Java	310,000	364,000	396,000	363,950	365,950	374,400	311,400
British India	60,000	60,000	55,000	50,000	50,000	45,000	60,000
Brazils	170,000	220,000	320,000	260,000	186,000	269,000	359,900
Manila, Cebu, and Iloilo	180,000	210,000	174,000	180,000	186,000	203,400	122,000
Louisiana	125,000	140,000	158,000	80,900	127,900	94,500	128,400
Peru	30,000	30,000	30,000	26,000	27,000	35,000	25,000
Egypt	35,000	35,000	35,000	50,000	65,000	41,000	37,000
Sandwich Islands	115,000	120,000	105,000	95,000	96,500	76,500	63,700
Total of Cane	2,271,000	2,280,000	2,470,000	2,345,550	2,339,950	2,351,500	2,323,200
" Beet	3,170,000	2,735,000	2,451,900	2,733,900	2,223,600	2,546,000	2,361,000
Cane and Beet	5,441,000	5,015,000	4,921,900	5,079,450	4,563,550	4,897,500	4,684,200

From H. Clark & Co.'s *Monthly Report*, October, 1889.

IMPORTS AND EXPORTS (UNITED KINGDOM) OF RAW AND REFINED SUGARS.

JANUARY 1ST TO SEPTEMBER 30TH, 1888-1889.

Board of Trade Returns.

IMPORTS.

RAW SUGARS.	QUANTITIES.		VALUE.	
	1888.	1889.	1888.	1889.
	Cwts.	Cwts.	£	£
Germany	3,305,823	4,040,517	2,152,044	3,378,610
Holland	232,962	363,666	149,501	305,378
Belgium	439,982	535,749	279,876	372,528
France	13,397	128,436	9,793	113,768
British West Indies & Guiana	1,821,450	1,496,181	1,445,887	1,424,393
British East Indies	940,888	1,613,335	454,687	1,106,075
China and Hong Kong	10,733	34,916	6,420	28,040
Mauritius	189,988	283,283	128,691	280,226
Spanish West India Islands	304,376	49,535	223,412	44,230
Brazil	2,118,638	701,958	1,332,963	502,321
Java	3,038,206	1,519,625	2,286,185	1,403,737
Philippine Islands	545,824	745,815	261,614	471,980
Peru	363,961	495,435	269,183	420,522
Other Countries	600,819	621,056	436,747	548,683
Total of Raw Sugars ..	13,927,047	12,629,507	9,437,003	10,400,491
Molasses	315,415	344,319	97,681	128,169
Total Sugar and Molasses	....	....	9,534,684	10,528,660
REFINED SUGARS.				
	Cwts.	Cwts.	£	£
Germany	2,190,552	2,984,863	1,910,845	3,116,654
Holland	1,028,584	923,893	932,236	968,661
Belgium	150,605	175,374	143,860	188,220
France	575,002	1,225,440	525,629	1,326,487
United States	40,162	9,896	37,450	9,560
Other Countries	389,711*	627,371*	309,895*	629,315
Total of Refined	4,374,616	5,946,837	3,859,915	6,238,897
EXPORTS.—REFINED SUGARS.				
	Cwts.	Cwts.	£	£
Sweden and Norway	57,530	53,624	47,585	49,076
Denmark	68,791	88,509	50,318	72,403
Holland	64,233	66,546	46,771	56,785
Belgium	21,124	18,924	14,908	14,471
France	5,445	5,308	3,827	4,220
Portugal, Azores, & Madeira	54,667	53,384	40,085	45,463
Italy	66,575	62,504	49,102	56,256
Other Countries	145,053	103,962	114,536	96,123
Total of Exports	483,418	452,761	367,132	394,797

* Imported almost entirely from Russia.

IMPORTS OF FOREIGN REFINED SUGAR.

The British Sugar Refiners' Committee furnish us with the following figures, giving the imports of foreign refined sugar for the month of September, 1889, compared with the corresponding month of the two preceding years, and the average monthly imports for the year compared with those of 1886, 1887, and 1888, distinguishing the quantities of "Lumps and Loaves" from "other sorts," and giving the separate imports from each country:—

Countries from which Sugar has been imported.	" LUMPS AND LOAVES."						" OTHER SORTS," Including Crushed Loaf, Granulated, Crystallized, &c.						TOTAL.								
	Monthly Average.			Sept.	Sept.	Sept.	Monthly Average.			Sept.	Sept.	Sept.	Monthly Average.			Sept.	Sept.	Sept.			
	1886	1887	1888	1889	1888	1889	1886	1887	1888	1889	1888	1889	1886	1887	1888	1889	1888	1889			
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.			
France.....	1462	1363	1686	1858	1087	873	1245	2688	5099	4855	4948	2363	927	5016	4150	6402	6541	6806	3450	1800	6261
Holland	3508	3780	3267	2223	2827	2869	992	1428	2483	2675	2908	2157	2146	2456	4036	6263	5942	5131	5284	3719	3441
Germany & Austria ..	990	1347	1510	2519	617	688	1056	8634	10463	11729	14062	6377	6111	6826	7661	12625	13028	11658	6749	7382	
Belgium	344	592	622	764	724	517	456	113	308	227	209	299	183	125	457	900	849	973	1023	700	581
United States	864	464	8	..	210	..	..	5078	2804	157	54	438	10	11	5932	3268	165	54	678	10	11
Russia .....	..	..	30	..	..	..	..	3412	452	1939	2675	1155	328	567	3412	455	1959	2705	1155	328	567
Other Countries ....	..	..	1	319	..	..	55	9	15	2	462	..	8	..	9	15	3	781	..	8	55
Total	7158	7539	7094	7713	5495	4897	3794	19362	21624	21604	26318	13089	9713	14504	26520	28163	28698	33031	18584	14610	18208

SUGAR STATISTICS—GREAT BRITAIN.

To OCTOBER 26TH, 1889 AND 1888. IN TONS.

PORTS.	STOCKS.		DELIVERIES.	
	1889.	1888.	1889.	1888.
London.....	49,884 ..	34,405	4,368 ..	6,307
Liverpool.....	79,136 ..	99,288	6,896 ..	5,998
Bristol	23,554 ..	18,937	*5,922 ..	4,032
Clyde	1,414 ..	460	699 ..	880
	<hr/>	<hr/>	<hr/>	<hr/>
	153,988	153,090	17,885	17,217
From Jan. 1st....			739,797	174,184

* Including 730 tons exported.

PORTS.	LANDINGS.	
	1889.	1888.
London.....	4,607 ..	2,738
Liverpool.....	2,816 ..	5,346
Bristol	6,138 ..	5,160
Clyde	588 ..	690
	<hr/>	<hr/>
	14,149	13,934
From Jan. 1st	749,682	741,504

NEW YORK PRICES FOR SUGAR.

From Willett, Hamlen & Co.'s Report, October 17th, 1889.

FAIR REFINING.	96c/o CENTS.	GRANU- LATED.	STAND. A.	STOCK IN FOUR PORTS.
Oct. 17, 1889.—5½c.	6½c.	7½c.	7c.	Jan. 1, 1889— 32,254 tons.
Oct. 18, 1888.—5½c.	6½c.	7½c.	7½c.	Jan. 1, 1888— 47,798 tons.
Oct. 20, 1887.—5c.	5 9-16c.	6 11-16-¾c.	6 5-16c.	Jan. 1, 1887—102,279 tons.
Oct. 21, 1886.—4 9-16c.	5 3-16c.	5 7-16c.	5 7-16c.	Jan. 1, 1886— 57,323 tons.
Oct. 22, 1885.—5 7-16c.	6½c.	6½c.	6 3-16c.	Jan. 1, 1885— 89,186 tons.
Oct. 16, 1884.—4¾c.	5½c.	6½c.	5½c.	Jan. 1, 1884— 60,900 tons.
Oct. 18, 1883.—6¾c.	7 11-16c.	8½ 11-16c.	8½c.	Jan. 1, 1883— 50,297 tons.
Oct. 19, 1882.—7¾c.	8c.	9½c.	8¾c.	Jan. 1, 1882— 43,927 tons.
Oct. 20, 1881.—8½c.	8½c.	10c.	9½-¾c.	Jan. 1, 1881— 66,999 tons.
Oct. 14, 1880.—7¾c.	8½c.	9½c.	9½-¾c.	Jan. 1, 1880— 63,558 tons.

STOCKS OF SUGAR IN THE CHIEF MARKETS OF EUROPE ON THE
30TH SEPTEMBER, FOR THREE YEARS, IN THOUSANDS
OF TONS, TO THE NEAREST THOUSAND.

Great Britain.	France.	Holland	German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1889.	TOTAL 1888.	TOTAL 1887.
156	62*	1	60*	34	13	326	304	387

* Estimate.

CONSUMPTION OF SUGAR IN EUROPE FOR THREE YEARS, ENDING
30TH SEPTEMBER, IN THOUSANDS OF TONS, TO THE
NEAREST THOUSAND.

Great Britain.	France.	Holland	German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1889.	TOTAL 1888.	TOTAL 1887.
1273	435	36	410	255	350	2759	2718	2674

ESTIMATED CROP OF BEET ROOT SUGAR ON THE CONTINENT OF EUROPE
FOR THE PRESENT CAMPAIGN, COMPARED WITH THE ACTUAL CROP,
OF THE THREE PREVIOUS CAMPAIGNS.

(From Licht's Monthly Circular.)

	1889-90.	1888-89.	1887-88.	1886-87.
	Tons.	Tons.	Tons.	Tons.
France.....	550,000 ..	466,767 ..	392,824 ..	485,739
German Empire ..	1,100,000 ..	990,604	959,166 ..	1,012,968
Austro-Hungary..	700,000 ..	523,242 ..	428,616 ..	523,059
Russia and Poland.	525,000 ..	537,000 ..	441,342 ..	487,460
Belgium	180,000 ..	145,804 ..	140,742 ..	135,755
Holland	55,000 ..	46,040 ..	39,280 ..	36,098
Other Countries..	60,000 ..	55,000 ..	49,980 ..	49,127
Total....	3,170,000	2,764,457	2,451,950	2,730,206

It will be seen that Mr. Licht has in his present Estimate made no alteration upon that of previous month, for Crop 1889-90; Mr. Görz has raised his Estimate 70,000 tons—his figures now are 2,858,000, or 312,000 tons less than Mr. Licht's.

STATE AND PROSPECTS OF THE ENGLISH SUGAR MARKET.

The cane sugar market shows for the past month a further decline of 2s. to 3s. per cwt., and remains very dull.

Beet has also undergone a further heavy fall, closing on the 29th October rather better at 11s. 7½d. for prompt, 11s. 9d. for November, and 12s. 1½d. for December delivery. A week previously sales were made at 11s. to 11s. 1½d. for prompt delivery. It is difficult to explain this recovery, except on the hypothesis of a rebound from the extreme depression.

Mr. Licht is not content with his previous estimate of the coming crop, and thinks he may have to increase it still further. We give on page 563 the estimates of the *Prager Zuckermarkt*.

The imports of foreign refined, for the nine months of 1889, were 144,059 tons, being an increase on last year, for the same period, of 39,053 tons.

The deliveries into the United Kingdom (four principal ports), up to 26th October, show a decrease, as compared with 1888, of 34,387 tons.

The stocks have slightly decreased, and are now about 20,000 tons less than at the corresponding time in 1888.

Present quotations for the standard qualities, as under, are:—

FLOATING.		Last Month.
Porto Rico, fair to good Refining	12/- to 13/6 against	15/- to 16/-.
Cuba Centrifugals, 97% polarization	12/6 to 13/6 ..	16/6 to 16/9.
Cuba, fair to good Refining	12/6 to 12/9 ..	15/6 to 15/9.
Java, No. 14 to 15 D.S.	14/3 to 14/6 ..	17/- to 17/3.
British West India, fair brown	12/- to 12/6 ..	15/6
Bahia, low to middling brown	10/6 to 11/- ..	11/6 to 12/9.
„ Nos. 8 to 9	11/6 to 12/- ..	13/6 to 14/-.
Pernams, regular to superior Americans. .	11/9 to 12/3 ..	13/6 to 15/6.
LANDED.		Last Month.
Madras Cane Jaggery	8/3 to 8/6 against	10/9 to 11/-.
Manila Cebu and Ilo Ilo	8/6 to 8/9 ..	10/- to 11/-.
<hr/>		
Paris Loaves, f.o.b.	18/-	against 20/-
Russian Crystals, No. 3, c.i.f.	14/-	„ 17/3
Titlers	20/6	„ 22/6
Tate's Cubes	21/-	„ 23/-
Beetroot, German, 88%, f.o.b.	11/6 to 11/7½	„ 13/-

THE SUGAR CANE.

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 The writers alone are responsible for their statements.

N.B.—All communications to be addressed, and Cheques and P.O. Orders made payable to THE PROPRIETOR, 6, Ward's Buildings, Deansgate, Manchester.

For Scale of Charges for Advertisements, see page xi.

For Table of Contents, see page i.

American Government reports state that the experiments with regard to the introduction of diffusion on cane sugar plantations in Kansas and Louisiana, which have been conducted for several years, may be considered a success. At the outset only 145lbs. of sugar were obtained from one ton of cane, but during the past year 200lbs. were got, and the process is already in full work on four plantations in Louisiana.

We have been favoured by the Secretary of the U.S. Department of Agriculture with a detailed record of experiments made at the Sugar Experiment Station, on Calumet Plantation, at Pattersonville, Louisiana, copious extracts of which will be found on pp. 632 *et seq.* Mr. Wibray J. Thompson, who has for years had entire control of the factory, will no doubt be glad to furnish any special information desired.

The following are the remarks of the *Louisiana Planter* on the subject of the results of diffusion applied to the cane in the Sandwich Islands:—

“Cane diffusion again scores a victory, and breaks all previous records both for cane and beet. Those among us who a few years since prematurely announced that diffused cane juices could not be made to crystallise, will now have permanently to draw in their horns—so many of these are still remaining out to the weather. We learned with astonishment, last May, of Waiakea's great performance, by which, from a run covering 130 acres of land, an average of 289 pounds of sugar were obtained on the Sandwich Islands, with double

mill and maceration. The announcement is now made in the Hawaiian *Planters' Monthly* for September, just received, that Col. Spalding's battery, at plantation Kealia, upon the island of Kauai, one of the same group, on a full week's trial run of 524,000 pounds of sugar, secured an average of 307 1-5 pounds, besides a large yield of rich molasses, per short ton of cane, the clarification being altogether performed and completed in the cells."

A new process, of roasting the cane before it is put through the mill, is said to have been invented in Kansas. The advantages are said to be that the cane is rendered remarkably soft; the juice swells in the cellules under the influence of heat, breaks the walls, and is automatically clarified in the fibre. This "cooking" changes the contexture and the chemical nature of the cane, and is said to have given very good results, amounting to an increase in the yield of juice of five per cent. It has only been applied to sorghum, but satisfactory details seem to be wanting.

Mr. Licht's estimates are still being objected to in various Continental countries. The *Sucrerie Belge* makes the following observations on the subject:—

With the present issue will cease the publication of our information concerning the (Belgian) crop; in the first place because the latter will not now undergo any great modification; and secondly, because the Statistical Bureau, in a better position than ourselves to enlighten the public, supplies in the present number the general result of its investigations in various parts of the globe.

We have a right to remark that these figures confirm in a singular manner the approximate estimate which we made of the Belgian production in putting it at between 130 and 140 thousand tons.

We think that this enormous production is to be regretted. For the manufacturer it is absolutely disastrous, for the farmers it is the precursor of a notable fall in the price of beets.

We might, on the other hand, regret that it was not still larger, if it were agreeable to us to see the assertions of Mr. F. O. Licht realised. It is well known that this equally honourable and clever statistician attributes every year most ridiculous figures of production to our country, such as 145,804 tons for 1888-89; 180,000 tons for 1889-90.

These figures, when once issued by him, appear to become articles of faith, before which we must all bow. Even the official results have not the power to modify the august estimates of Mr. F. O. Licht, of Magdeburg.

And the poor *Sucrerie Belge*, having occasionally irreverently cast doubt on the accuracy of these Olympian statistics, is now overwhelmed by their author with Latin proverbs such as the following:—*O si tacuisses philosophus mansisses*. Wit and beetroots appear to sprout *pari passu* at Magdeburg.

We are again favoured with the announcement of a new discovery for refining by electricity. The result of the Brooklyn fiasco should make people extra-cautious in examining any project that is put before them under this head. At the same time, we do not by means assert the impossibility of electricity being eventually employed in refining.

By a decree in the *Gaceta de Madrid* of the 30th August, the export duties hitherto existing on certain articles, including sugar, are abolished, with the exception of that on tobacco. The duty on sugar was formerly 0.70 pesetas per 100 kilos., but was reduced by 20 per cent. in March, 1887.

According to a letter in the New York *Handelszeitung*, the opinions held and the remarks often publicly expressed, both in European and American journals, to the effect that the Sugar Trust was in strong sympathy with the Magdeburg Syndicate, and had even supported the latter, are absolute nonsense. It is true that the Trust happened to assist the latter by buying about 40,000 tons of beet-sugar at high prices, but this was purely a business transaction, like any other.

It is understood that the result of the decisions in the recent legislation will probably be that the "Trust" will be converted into a "Corporation" with a regular charter, at any rate it will have shortly to assume another form, as it is evident that its maintenance as at present existing will be impossible in face of the universal opposition manifested in every quarter, both legal and commercial. But the Trust, in whatever form it may be continued, will have to reckon with a by no means despicable opponent, viz., the so-called Sugar-King, Claus Spreckels, who, always a bitter enemy of the combination, now professes himself ready to declare war to the knife against it as soon as his large new refinery at Philadelphia is finished. The members of the Sugar Trust, as is well known, always reckoned that they would in course of time be able to count the powerful "Plattdütscher" (Low-German) among their number, but they have been sorely disappointed. It is, of course, within the limits of

possibility that such a combination against the well-being of the community may yet take place, but up to the present moment all appearances point the other way, and so long as the course of the Californian sugar-king continues so successful as it has hitherto been, it is more than probable that he will prefer to reign alone.

An animated correspondence is being conducted in the *Deutsche Zuckerindustrie* between Dr. Bergmann and Mr. Jos. Görz, with regard to the International Sugar Bank (see pages 340, 405, and 460, of this year's *Sugar Cane*), which the latter is so active in promoting, Dr. Bergmann sees great danger to the well-being of the German sugar industry in the participation to so large an extent of foreign, principally English capital (out of £3,000,000 only £200,000 are offered to German capitalists), and considers that the interests of England would probably be almost exclusively considered. As England is a non-producing country, her interests would manifestly frequently be opposed to those of a large producing country like Germany. Further, Dr. Bergmann points out that under present circumstances, where advances on sugar are generally made by comparatively small houses, the danger of combination is not so great as materially to threaten the interests of the producer; whereas there would be a considerable probability that a powerful institution, with so large capital, would be tempted to influence the market, by manipulating its sales in such a manner as practically to produce such unhealthy movements as that which has lately had such disastrous results at Magdeburg. On the whole Dr. Bergmann would decidedly prefer the establishment of an exclusively German Sugar Bank, without any obligation to foreign capital. The explanations, given at great length by Mr. Görz, have not succeeded in allaying Dr. Bergmann's suspicions.

The United States Minister of Agriculture, the Honourable J. M. Rusk, has lately visited Kansas, with the object, to use his own words, of convincing himself whether the money granted by Congress was being applied in conducting really profitable experiments in the preparation of sorghum. His conclusion is that at the present time the production consists half of syrup; if this can be converted into sugar the industry appears to him to be decidedly profitable, in the contrary case he is exceedingly doubtful whether the manufacture of

sugar from sorghum can be carried on with profit. The *Louisiana Planter* considers that it is still too early to form a definite opinion as to how far the sorghum cane can be utilised for the supply of sugar, but if the question had to be answered at once the reply must be in the negative.

Owing to want of space, we have been compelled to omit the List of Patents this month. It will appear as usual in January, 1890.

In our November issue we gave the estimates of the *Prager Zuckermarkt* for the beet sugar production of 1889-90, remarking, at the same time, that such figures could only be regarded as approximate guesses. The need of such cautionary remarks is shown by the fact that the same journal, which, as we before observed, has been of late years tolerably accurate in its estimates, now gives the following figures, which show an advance of 221,000 tons on those previously stated:—

	1888-89. Tons.		1889-90. Tons.		Differences. Per Cent.
Austria	515,000	..	718,000	..	+ 40
Germany	978,500	..	1,080,000	..	+ 10
France	460,000	..	600,000	..	+ 30
Russia	515,000	..	486,000	..	— 6
Belgium	125,500		160,000	..	+ 27
Holland.....	30,000	.	40,000	..	+ 33
Other Countries..	26,000	.	35,000	..	+ 34
	<u>2,650,000</u>		<u>3,119,000</u>		<u>+ 17</u>

The unusually mild weather of the past few weeks has been favourable to the beet crop, and is the cause of the better yield which has led to the higher estimates. The following concluding remarks of our contemporary are worthy of note:—

“The production of one unusually large campaign, such as this, can be disposed of by the world's market, but if the cultivation of beets should again be carried beyond reasonable limits in the next campaign, it is not difficult to foresee the consequences to which this would lead as regards the prices of sugar, and we believe that if we should have a repetition of the year 1884, we shall find the limits of prices lower than was then the case, because of the general reduction in the cost of production which has since taken place.”

Mr. Licht's last estimates are 211,000 tons above those of the *Prager Zuckermarkt*, his figures being as follows:—

1889-90 Sugar Production. (Mr. Licht's Estimates.)	
	Tons.
Austria	720,000
Germany	1,175,000
France	650,000
Russia	490,000
Belgium	180,000
Holland	55,000
Other Countries.....	60,000
	<hr/>
	3,330,000

The excess over last year will thus be, according to Mr. Licht, 566,000 tons; according to the *Prager Zuckermarkt*, 469,000 tons. Supposing there should be no deficit in the supply of cane sugar, it must be remembered that there is every probability that the consumption will again rapidly resume its normal rate of increase, checked for a time only by the extraordinary advance in prices, so that it is possible that by the end of the campaign of 1889-90, the above excess may have been so far absorbed as to leave plenty of room for speculators to interfere with the ordinary course of the market.

Of the 51 sugar plantations announced in our October issue as being for sale in August, by order of the Chancery Court of Barbados, five, viz.: Sterling, Redland, Thurband, The Grove, and Congo Road, have, according to the list published by the *Barbados Globe* of the 10th October, been sold. There remain, therefore, 46 still on sale. The same paper reports weather as all that could be desired for the planter, and prospects satisfactory.

The sugar industry appears to be making some progress in the Canary Islands, as it is stated that new machinery of an extensive character has been purchased in this country, to set up on the island of Teide, where the cane cultivation is the largest.

We take the following from the *Manufacturer and Inventor*: "A correspondent, a member of the Melbourne Chamber of Manufacturers, writing to us a short time ago, says: 'I think I am perfectly justified in saying that a uniform tariff will be adopted by all the Colonies at an early date; and further, the abolition of all duties

between the Colonies. And this will be further followed by a confederation of the Colonies. You asked me what was necessary to be done to further the interest of the sugar industry in Australia. I feel quite unable to answer the question, except by saying that I believe Australia will settle this for herself at an early date, by adopting a uniform duty, and a free interchange of all dutiable goods between the Colonies. When this takes place there will not be a pound of sugar exported from the Colonies; and the duty will be high enough to make both sugar growing and refining remunerative, notwithstanding the great disparity between our high-priced labour, which we hope to maintain, and the low price paid in Hong Kong, Java, and the Mauritius, with which we have to compete. The Queensland Government having decided that Kanaka and other coloured labour shall cease at the end of 1890, points to the entire extinction of sugar-growing in that colony, unless some other mode of working the cane fields than that at present in vogue can be introduced. Fiji is a Crown Colony, and at present there is no difficulty there about coloured labour. Should this be continued, and the Colony join the other Colonies in inter-colonial free trade, I see no reason whatever to prevent a large expansion of its sugar-growing industry, with a mutual advantage to both the Colony and the planters."

CONSUMPTION OF SUGAR IN FRANCE FROM 1884 TO 1888.

From the *Journal des Fabricants de Sucre*.

The following are the figures of the annual consumption derived from official sources:—

QUANTITIES OF SUGAR ON WHICH DUTY WAS PAID (IN TONS).

	1884.	1885.	1886.	1887.	1888.
Foreign	146,607	167,353	61,823	38,722	83,665
Colonial	73,930	109,688	98,013	119,236	125,954
Home production	322,365	225,910	407,391	452,642	369,192
	<u>542,902</u>	<u>502,951</u>	<u>567,227</u>	<u>610,600</u>	<u>578,811</u>
Deduct refined sugar ex- ported reduced to raw sugar }	124,835	77,726	125,443	163,762	146,785
Consumption	<u>418,067</u>	<u>425,225</u>	<u>441,784</u>	<u>446,838</u>	<u>432,026</u>

BRAZIL.

Probably no political event of importance, affecting a great country with a considerable population, has ever happened so unexpectedly as the revolution in Brazil, which, with comparatively little disturbance, and in the space of a few hours, has resulted in the dethronement of a sovereign, supposed to have been universally respected and esteemed, and the replacement of an almost despotic monarchical government by a republic. It is too early as yet to pronounce on the eventual results of this definitely unlooked for change. Those who have studied the question are well convinced that the immense region now known as the United States of Brazil has a future of almost infinite possibilities, that the country is at best but very slightly opened up, and, to come to the point most interesting to our readers, that the amount of sugar which might, under really favourable financial and politico-economical conditions, be produced, would form no small item in the calculations which have to be made by all engaged in the sugar trade. The government, as is tolerably well known, had some time ago taken active measures to put the sugar industry, which hitherto could hardly be considered as a success, on a better footing, and after doing all that seemed for the time practicable, from a financial point of view, by guaranteeing interest on the capital invested in central factories and some similar undertakings, it decided last year to send out a commission to inquire into the method of cultivation of the cane and processes for the production of cane sugar in use in Martinique and Guadeloupe. This commission had just presented its report to the Brazilian Government, and it was to be expected that some practical result would follow from the inquiry. How far the progress of the industry will be encouraged or hindered by the remarkable change which has taken place is hard to say. The great danger of a Republican Government is the liability to sudden change; South America is the very home of *pronunciamientos*, i.e., the sudden rise to power, through underhand conspiracy, of individuals, generally military men, often ill fitted to assume the reins of government, and possessing little patriotic feeling, sure therefore to make use of their position rather to aggrandise themselves and party than to work for the good of the community, especially the commercial community, the very heart and soul of the prosperity of a State. Adding to this that capital is notoriously shy of countries where there is no stable form of govern-

ment, and the liability to sudden wars and disturbances is great, and remembering that the fiscal administration is frequently corrupt and imperfect in these South American Republics, we shall see that there is some cause, in the absence of any guarantee from past experience, for fear that the Republican Government just established may not even be so beneficial for the country as the one which it has replaced. There is a further possibility that some of the States may think that their interests would be better served by their severing themselves from the remainder, and so an internecine war be provoked, which would prove very injurious to commerce.

Under the circumstances, the subjoined extract from the *Stock Exchange* (published a few weeks ago), cannot fail to be of interest:—

“In this article I propose to treat of the sugar prospects in Brazil—a country which as yet is little known to the great bulk of English people, but which, from its richness and fertility, is attracting more and more attention, and drawing more and more English capital to itself. At the present moment the outlook in the sugar line is decidedly bad. The three English companies, viz.: the Bahia Central, the Northern, and the Central Sugar Factories of Brazil (Limited), have all been started within the last few years. First class plants of machinery have been erected in each factory; experienced Demerara men and practical sugar chemists have been sent to work them; railway lines, piercing the valleys for miles in every direction from the different “usines,” have been laid down; and one would think that such an undertaking, backed by a Government guarantee of 6½ per cent. would be bound to pay.

“The melancholy fact, however, remains that one of the companies (the Central) has had to go into liquidation after working four years. The Northern has only one factory (Tiuma) working, and the Bahia has just managed to scrape along and pay expenses. Nor are the reasons for such a state of affairs far to seek. In the first place, the English do not plant the canes themselves, as in Demerara and most of the West Indian islands. There is therefore not the same control over the supply of canes that exists on plantations where both the growing and the grinding are in the hands of the same individual. In the second place, the want of labour since the freedom of the slaves has greatly increased the difficulty of production, transportation and manipulation; but the greatest and gravest drawback is primarily the fault of the promoters themselves, and subsequently the stubborn attitude of the Brazilian planters, who allowed the four

BRAZIL.

Probably no political event of importance, affecting a great country with a considerable population, has ever happened so unexpectedly as the revolution in Brazil, which, with comparatively little disturbance, and in the space of a few hours, has resulted in the dethronement of a sovereign, supposed to have been universally respected and esteemed, and the replacement of an almost despotic monarchical government by a republic. It is too early as yet to pronounce on the eventual results of this definitely unlooked for change. Those who have studied the question are well convinced that the immense region now known as the United States of Brazil has a future of almost infinite possibilities, that the country is at best but very slightly opened up, and, to come to the point most interesting to our readers, that the amount of sugar which might, under really favourable financial and politico-economical conditions, be produced, would form no small item in the calculations which have to be made by all engaged in the sugar trade. The government, as is tolerably well known, had some time ago taken active measures to put the sugar industry, which hitherto could hardly be considered as a success, on a better footing, and after doing all that seemed for the time practicable, from a financial point of view, by guaranteeing interest on the capital invested in central factories and some similar undertakings, it decided last year to send out a commission to inquire into the method of cultivation of the cane and processes for the production of cane sugar in use in Martinique and Guadeloupe. This commission had just presented its report to the Brazilian Government, and it was to be expected that some practical result would follow from the inquiry. How far the progress of the industry will be encouraged or hindered by the remarkable change which has taken place is hard to say. The great danger of a Republican Government is the liability to sudden change; South America is the very home of *pronunciamentos*, i.e., the sudden rise to power, through underhand conspiracy, of individuals, generally military men, often ill fitted to assume the reins of government, and possessing little patriotic feeling, sure therefore to make use of their position rather to aggrandise themselves and party than to work for the good of the community, especially the commercial community, the very heart and soul of the prosperity of a State. Adding to this that capital is notoriously shy of countries where there is no stable form of govern-

ment, and the liability to sudden wars and disturbances is great, and remembering that the fiscal administration is frequently corrupt and imperfect in these South American Republics, we shall see that there is some cause, in the absence of any guarantee from past experience, for fear that the Republican Government just established may not even be so beneficial for the country as the one which it has replaced. There is a further possibility that some of the States may think that their interests would be better served by their severing themselves from the remainder, and so an internecine war be provoked, which would prove very injurious to commerce.

Under the circumstances, the subjoined extract from the *Stock Exchange* (published a few weeks ago), cannot fail to be of interest:—

“In this article I propose to treat of the sugar prospects in Brazil—a country which as yet is little known to the great bulk of English people, but which, from its richness and fertility, is attracting more and more attention, and drawing more and more English capital to itself. At the present moment the outlook in the sugar line is decidedly bad. The three English companies, viz.: the Bahia Central, the Northern, and the Central Sugar Factories of Brazil (Limited), have all been started within the last few years. First class plants of machinery have been erected in each factory; experienced Demerara men and practical sugar chemists have been sent to work them; railway lines, piercing the valleys for miles in every direction from the different “usines,” have been laid down; and one would think that such an undertaking, backed by a Government guarantee of $6\frac{1}{2}$ per cent. would be bound to pay.

“The melancholy fact, however, remains that one of the companies (the Central) has had to go into liquidation after working four years. The Northern has only one factory (Tiuma) working, and the Bahia has just managed to scrape along and pay expenses. Nor are the reasons for such a state of affairs far to seek. In the first place, the English do not plant the canes themselves, as in Demerara and most of the West Indian islands. There is therefore not the same control over the supply of canes that exists on plantations where both the growing and the grinding are in the hands of the same individual. In the second place, the want of labour since the freedom of the slaves has greatly increased the difficulty of production, transportation and manipulation; but the greatest and gravest drawback is primarily the fault of the promoters themselves, and subsequently the stubborn attitude of the Brazilian planters, who allowed the four

factories (Cabo, Escada, Cuyambuco and Bom Gosto) of the Central to be shut up rather than yield to the fair and reasonable efforts of the company.

"In Bahia and Tiama the companies are still alive, and in the former place it is to be hoped that the comparative success of their last *safrá* will develop a further extension of cultivation in that quarter. Their machinery, by Duncan, Stewart & Co., has worked like a charm all through the crop, and where the cane supply is fairly good, as at Rio Tunda, the working has been 76 per cent. on the polariscope indications, and 8.4 per cent. of sugar on the weight of cane, a by no means bad result."

CANE CUTTING.

HOW SHOULD CANES BE TOPPED?

The *Louisiana Planter* calls attention to the following, which may or may not be correct, but which at any rate deserves the notice of cane cultivators:—

"On page 22 of Mr. Spencer's *Magnolia* report for 1885 (Bulletin II., United States Department of Agriculture), there occurs a calculation which possesses peculiar value at this time. He there shows how an average possible loss per acre of between \$8.50 and \$9.00 may be incurred by improperly topping, so as to leave one pink joint from each cane in the field. Correct cutting divides the cane through the node which separates the last pink from the first white joint. When the colour is in doubt the joint is to be considered white. Dr. Stubbs, in his Bulletin 10, page 6, very strongly condemns, however, the practice which permits any portion of the upper white part of the cane to reach the sugar house. Mr. Wibray Thompson, who examined carefully into this subject, at Calumet, last grinding, stated in the *Item*, of January 21st, 1889, that the available sugar in juice from these white joints is a negative quantity, calculated to restrain from crystallizing an equivalent of sugar in the juice derived from other portions of the plant with which it becomes mixed. He actually found the percentage of available sugar contained in the fluid expressed from their adhering leaf-sheaths equal to that in the juice of these joints themselves. He carried his investigations also to the bottom joints. Basing calculation upon the Calumet tonnage, and butt analyses of that season, and the 80 per cent. extraction its mill was at the time yielding, he established the average gross money loss per acre due to the loss of 2½ inches from the lower end of each cane, at \$16.90. Show this to your overseer and watch your knives personally!"

THE GERMAN SUGAR DUTIES AND THE LONDON CONVENTION.

In introducing the budget for 1890-91 Herr von Maltzahn-Gülz remarked that the Finance Department had thought it right, in the case of the sugar duties, to anticipate a decrease of revenue amounting to somewhat over M.2,000,000 (£100,000), but the influence which the London Convention might eventually have on the mode of levying the duties had not been taken into account, as it could not apply to the present budget.

The following remarks of the same government official may not be without interest, in view of the reports lately circulated that Germany contemplated the immediate total abolition of the duty on the beets, and, as a natural result, of the premiums on export.

“In the course of the debate an attack has been made on the present mode of levying the sugar duties, and it has been said that the tax on sugar as now existing, at any rate in so far as it is levied on the raw material, is a pure farce, and that it is absolutely necessary to abandon this mode of taxing the production of sugar. It is well known to you that the federated governments have taken the preliminary steps in this direction; Germany has taken part in the proceedings with regard to the conclusion of a Convention between the principal sugar-producing States, having for its object the abolition of the premiums in all those countries. The Convention has been provisionally agreed on, its ratification is not yet completed, the further necessary preliminaries with respect to the alteration of the legislation in the individual countries have been concluded. In May this year the small preparative commission, provided for in the Convention, met in London, and we shall for the present have to wait and see how matters further develop, and whether this Convention will *de facto* come into existence or not. According to the Convention the time reserved for the ratification only expires at the commencement of August, 1890, so that the Convention cannot come into force for two years. I think then that the present moment would be absolutely inappropriate for making any alteration in the existing sugar duties, and that I may leave this part of the subject.”

Herr v. Maltzahn further remarked, in reply to an inquiry, that the draft of the law which it was proposed, in conformity with the Convention, to enact, had been laid before the Commission at its

Meeting in London in May last, and that no objection to the proposed statute had been lodged by any of the States participating in the Convention. As yet nothing definite could be stated with regard to the fate of the Convention, as it was by no means settled whether it would be ratified by all parties concerned. The English Cabinet had deferred the consideration of the second reading of the bill affecting the Convention until the coming session.

SUGAR CULTIVATION IN QUEENSLAND.

(A Letter to the *Tropical Agriculturist*.)

It is only some twenty years since the sugar cane was introduced into Queensland and every effort made to foster the industry by offering bounties for the first 500 tons of sugar made in the colony; and now what do we see, but the Government, urged on by the democratic element resulting from free emigration from Europe, distinctly refusing to continue the importation of Kanakas, and if this course is persisted in, the sugar industry in Queensland *must be abandoned*. Those who are acquainted with the subject know very well that in climates where the cane flourishes best, white labour for certain field operations is an *impossibility*, be the wages ever so high, and it is a lamentable fact that men of capital and energy should be obliged after years of hard work, to shut up their mills and allow the cane fields to go out of cultivation because freedom in labour is not allowed. For further particulars on this important question I would refer your readers to my article in the *Field* of May 4th, 1889.

JOHN HUGHES.

[It may have been right, in view of abuses, to stop the importation of Kanakas (South Sea Islanders), but immigration from India ought to have been allowed. The prospect now is that five millions of property will be sacrificed.—Ed. *Trop. Agr.*]

EXPORTS OF SUGAR FROM GERMANY.

The German exports of refined and crystallised sugar, up to the 31st August last, amounted, according to the return of the Imperial Statistical Bureau to 113,015 tons, being 7,500 tons in excess of last year for the corresponding period. The exports of raw sugar up to 31st August last were 214,594 tons, being 54,430 tons in excess of the quantity exported in the corresponding eight months of 1888.

CRYSTALLISED GRAPE SUGAR.

In August, 1888, we gave a description, contributed to the *Chemiker Zeitung* by Dr. E. O. Lippmann, of the production of pure grape sugar.

Dr. Lippmann has now sent to the same journal a report on some further results of the working of the same factory. He does not give any further information as to the cost of production. The following is a translation :—

“Last year I gave a description of the products of a glucose sugar manufactory using the Cords-Virneisel process, and showed that they possessed a purity unusual in manufacturing on a large scale in this country.

A short time ago I received from the same factory some samples of dextrose after-products, in reddish, transparent, solid lumps of great hardness and firmness, which in their outward appearance were exactly like candy-crust, being composed of numerous more or less perfectly developed, closely adhering crystals of considerable size.

The analysis showed :—

	Per cent.
Water	4.750
Grape sugar by polarisation (92.20 by Fehling's solution)	91.840
Ash	0.219
Non-sugar	3.191

The quotient of purity was 96.44. Hence this product also is of remarkably satisfactory composition.

The fact that in this case also the reduction method gave higher figures than the polarising process, would indicate an absence of dextrines of high rotatory power, such as are apt to render impure the ordinary commercial glucose sugars, which absence I already pointed out last year as characteristic of the sugars produced by the Cords-Virneisel process. A solution, containing in 100 ccm. 4.61 gr. of glucose sugar, showed directly after it had been dissolved a specific rotatory power of 99.68° , which fell, after twenty-four hours, to 52.49° . These figures correspond almost exactly with those given for the bi-rotation of pure glucose.

The sugar consisted of glucose-anhydrid and could be heated up to nearly 140° without altering or melting. On fermentation the contents of grape sugar was indicated as 92.74%, being again more than was shown by polarisation, so that we may assume, as far as con-

clusions can be drawn from this method, so difficult as it is to conduct, that a portion of the non-sugar also is fermentable."

In America large quantities of glucose, starch or grape sugar, as the article is variously called, are used in brewing ale and beer, but a certain amount is also used in the manufacture of candies of various forms, which are consumed in such enormous quantities by our American brethren, male and female, old and middle-aged as well as young. The following extract from a letter to the *Louisiana Planter* will not be without interest: "Candies made from cane sugar only, are, as we all know, too sweet to be eaten in any amount, and its brittleness and liability to crystallize makes some kind of addition (possessing less sweetness and greater "gumminess") necessary to most kinds of confections. Starch sugar, or glucose, is, therefore, a most welcome means of dilution, both on account of its lower degree of sweetness, its gumminess (having a retarding effect on crystallization), and, furthermore, its healthfulness, as any student of physiology will testify. Cane sugar, as well as starch and bread, must first be converted into grape sugar, by the action of the gastric juices, before it can be absorbed by the system. On this account, considerable digestive energy is lost by a weak system. If glucose was used as a preservative for condensed milk, instead of cane sugar, no lime water should be necessary to neutralize the "acidity of the stomach" prevalent amongst children brought up on condensed milk. An extract from the *St. Louis Globe-Democrat*, that I find in the August number of the *New York Confectioner* expresses this well, in few words: 'Ask any physician to-day why children suffer less from excessive indulgence in candies than formerly, and he will tell you that the substitution of glucose (or grape sugar), for what might be called more orthodox commodities, is the cause.' In candy manufacture, grape sugar is, therefore, not only not 'useless,' but, on the contrary, very useful and welcome."

DIFFUSION *versus* MACERATION.

The following letter appears in the *Planters' Monthly* :—

Spreckelsville, Maui, H. I.,

October 11th, 1889.

Sir,—In the September issue, Mr. Williams has given us a very interesting account of the diffusion work at Kealia. The figures furnished are full, and, no doubt, as nearly accurate as possible. I

propose to take his figures and handle them in the same manner that we do in mill work.

On page 423, we find they had 77,628,950 lbs. of cane. It had 10 per cent. fibre, so we deduct the weight of fibre, and this gives us the weight of total juice as 69,866,055 lbs. The juice, by Mr. Williams' account, contained 17·8 per cent. sucrose, which would give a total of 12,436,157 lbs. sucrose in the above given cane. They obtained 10,573,675 lbs. of this sucrose, hence the loss was 1,862,482 lbs., or in other words 15 per cent.

In our best mills, when maceration is carried on with a dilution of 25 per cent. additional water, the margin of difference between such work and diffusion does not exceed 6 per cent. in favour of diffusion, (see former "Monthlies," when Waiakea received 289 lbs. of sugar per ton of cane,) by 25 per cent. additional water in maceration.

In Kealia, the dilution, we see, was thirty per cent. additional water, with an increase of 6 per cent. sugar.

The whole question of diffusion *versus* maceration, will eventually come down to the one consideration, fuel; for, generally speaking, we all lose in our boiling houses, whether we use diffusion or maceration, about 10 per cent., and it is only in the process of extracting the sugar from the cane as a juice, that diffusion exceeds crushing, and this becomes more evident by the work at Kealia, where 6 per cent. additional sugar was obtained with a large outlay on extra fuel.

In conclusion, the Kealia work exceeds our best maceration by 6 per cent., while it is shown 5 per cent. more water was required to do this, than has yet been recorded by our best maceration. Now we are all told we can have maceration up to this point, *i.e.*, within 6 per cent. of diffusion results, without any other fuel besides the bagasse. The question, therefore, is simply this: Will 6 per cent. additional sugar pay the extra fuel, not to mention the cost of making the change from mill to diffusion battery, while we have perhaps an equal chance of obtaining by a greater dilution in maceration, the little at present in favour of diffusion?

H. M.

The same paper estimates the value of the Hawaiian sugar plantations at about \$30,000,000. This amount is distributed as follows:—American owners, 22½ millions; British, 5 millions; German, 1¾ million; Native, nearly ¼ million; Chinese, ½ million; Norwegian, Portuguese, and Chilian, \$84,000.

EXTRACTS FROM A REPORT OF CALUMET SUGAR FACTORY, LOUISIANA.

CAMPAIGN 1888-89.

This factory is located on the immediate bank of the Bayou Teche, $4\frac{1}{4}$ miles above the post-office town of Patterson, parish of St. Mary, La., and has therefore an unlimited supply of water, well adapted to every sugar factory purpose. It is the result of additions and extensions made to an establishment began before but left in ruins by the war.

THE PLANT.

Its plant consists of: (1) Five-roller mill; (2) bagasse burner of the so-called Taylor type, the boiler setting being the invention of Mr. Lewis S. Clark, proprietor of the neighbouring Lagonda factory; (3) eight copper clarifiers, with a capacity of 1,306.3 gallons each; (4) five Kroog filter presses, manufactured by the Sangerhausen Machine Company, Germany, of 220 square feet filtering area each; (5) vertical double effect of 2,000 square feet heating surface per pan; (6) eight foot vacuum pan, affording 337 feet heating surface, operated at 15 pounds; average steam pressure; (7) seven Weston centrifugals, divided into one battery of four for first sugars and one of three for wagon sugars; together with appropriate pumps, sugar packers, electric lighting apparatus, machine shop, and their appurtenances.

Average coal consumed per ton of cane and per 1,000 pounds of commercial sugar during each of the last three campaigns has been as follows:—

	1886-87. lbs.	1887-88. lbs.	1888-89. lbs.
Average coal per ton of cane	105.4	117.8	130.41
Average coal per thousand pounds of sugar..	653.0	665.5	630.48

The three years' average per 1,000 pounds of sugar is believed to be the most satisfactory ever recorded for Louisiana. Steam is maintained for the wagon-room until the drying of any thirds is completed which may have been boiled, this in 1887-88 being only on May 17th. No thirds were made in 1886-87. The coal, as stated, is for all purposes, including washing of house, preliminary trials of machinery, warming of sleeping and other apartments, electric lighting, etc., and is all actually weighed, No hot water being allowed to escape from the establishment, the boilers are supplied almost entirely with hot distilled water.

For every 100 revolutions of the engine the first or three-roller mill accomplishes 5·142 and the back or two-roller mill 4·210 revolutions. The principal dimensions of the two mills are given below:—

	Length of rolls between collars. Inches.		Diameter of rolls. Inches.		Diameter of shelves. Inches.		Length of journals. Inches.		Diameter of journals. Inches.
Three-roller mill..	59·50	..	29·50	..	12	..	12	..	11
Two-roller mill ..	66·00	..	40·00	..	18	..	20	..	16½

This apparatus is operated upon a plan quite unlike that customary in the milling of cane in Louisiana in that the feed upon the carriers is maintained as uniform at all times as possible, variations in the amount of cane consumed being regulated to that received from the fields as nearly as practicable by altering the speed of the engine, the governor to which is provided with a speeding device. The speed of the centrifugals is likewise regulated to the requirements of the sugar being dried. The otherwise constant necessity for a change of the mills "set" is thus obviated, insuring a uniformity of expression and a reduction of time lost to be better secured only, it is believed, by the hydraulic-pressure regulator. The average juice extraction of this mill for a series of years, expressed in percents of the canes' weight, has been:—

	1885-86.	1886-87.	1887-88.	1888-89.
Extraction of 5-roll mill juice (per cent. of cane)	76·30	73·90	74·60	72·45

That of the 3-roll mill prior to the erection of the supplemental rolls, the same engineer remaining in charge throughout, was:—

	1881-82.	1882-83.	1883-84.	1884-85.
Extraction of 3-roll mill juice (per cent. of cane)	64·70	(*)	69·84	65·03

This indicates an average advantage, by campaigns, of 7·58 per cent. juice on the canes' weight, to the credit of the supplemental mill, in which no account is taken of the variations in the character of the canes or the quantity of these treated per hour, which remain much more constant in Louisiana than upon more tropical estates.

PROCESSES PURSUED.

The raw juices from the two mills, passing through paraffined wooden gutters, where they mix at once, enter a sulphur saturation machine placed as close to the crushers as convenient. This machine, of the paddle-wheel type, is described in Bulletin No. 3, page 99, of this Department, and, except for the excessive amount of power

* Inundated; no crop.

required to actuate it, seems highly satisfactory. The sulphurous gas is produced by the burning of sulphur in a small iron furnace kept surrounded and cool by running water. The fumes first pass through lead pipes, also submerged in constantly changing water which effects their thorough cooling, then over a considerable surface of running water intended to wash them free of H^2SO^4 . They enter the juice cool and practically free of the latter. A considerable quantity of this, probably formed between the water bath and the saturation box, is trapped off at the entrance to the last.

The draught necessary to a combustion of the sulphur is furnished by the movement of the paddle-wheel, and the furnace on which the combustion takes place is so constructed as to prevent, so far as practicable, the passage of any uncombined oxygen through the apparatus. Care is exercised to prevent the admission of air at any other point than through the furnace, as a safeguard against the subsequent production of sulphuric acid. A device to free the juice of its contained air also, before sulphurization, is proposed for next season, but seems little necessary.

The juice, entirely altered in appearance by this treatment, is then pumped at once into the defecators, upon the third floor. Bronze pump barrels and copper conduits are alone used for juice, skimmings, and syrups.

The coils of a defecator being covered, steam is immediately admitted to these, and the addition of lime begun at once. By the time the defecator is filled, the lining is complete, the juice heated, and skimming begun. No boiling in the defecator is permitted. The skimming having been completed, subsidence goes on for from one-half to one hour before decantation of the clear, defecated juice. About 2 inches of juice are removed from the surface of each defecator by the skimming and brushing, and about 8 inches of settlings are left behind in the bottom of each 35 inches, approximately, being, therefore, decanted. The decanted juice goes immediately to the double-effect, no further settling being permitted. Skimmings and settlings are run to an appropriate receiver on the floor below, are limed and reheated whenever this is thought necessary, and are pumped immediately through the filter-presses. The defecators are thoroughly washed with a water-hose and broom, the wash-water also going to the presses in the absence of wash-outs and a scum-ditch. The filtered liquors join the juice from which derived in the

double-effect's receiver, and are concentrated to syrup without delay. The rapidity and cleanliness with which these operations are performed probably account for the almost total absence of inversion, attributable to a use of sulphur, between raw juice and syrup, and for the absence of fermentation in the juice department. The work of the filter-presses received no attention from the laboratory this season.

Transparent liquors and a hard cake were the invariable rule. About eight hours and 60 pounds pressure were necessary to insure the last. Two hours were generally allowed for a cold-water lixiviation of the cake, a pressure some 10 pounds less than that employed for the juice being used and the sweet water being run to two and one-half or three degrees Baumé. This supplementary process, it is said, is nowhere else followed in Louisiana. Basing calculations upon last year's chemical data, the net savings from it, after deductions for extra evaporation, interest on extra plant, etc., will be about \$ 12 per day when the factory is working at its normal capacity—say, 300 tons cane per twenty-four hours. An extra large battery of presses was provided especially to meet the requirements of this lixiviating process. The filter-press cloths are customarily washed bi-weekly. On one occasion they were operated one week without cleansing. This introduced fermentation, and is not to be repeated. Six sets of filter-cloths answer for five presses. The wear and tear of these are nominal. After two years' service already, very few will need replacement before the close of another campaign. The syrup-tank bottoms and other sweet waters of the establishment are also brought back to the presses. The last operate entirely without expert attendance, except oiling of the juice-pump by the engineers. The lixiviation pump is allowed to run dry. The presses are worked on strict rotation and the times and other data of each pressing systematically recorded. Over 22 per cent. of the entire volume of juice passes through the presses.

The treatment of syrups is similar to that of other Louisiana establishments. It is not thought necessary to settle these, and they are not re-heated and skimmed after leaving the double effect. The first product is a large grained Y. C. sugar, which grades in the New Orleans market from choice to ultra-choice. The second product, boiled to wagons at a high string-proof, is a fine-grained article which dries very slowly in the centrifugals. As high as 50 per cent. commercial sugar was, in at least one instance, secured from second

massecuite. With sufficient vacuum-pan capacity, this product might, the present season, with its rich and pure juices, have probably been better grained in the pan. For the first time in the history of the establishment, the entire crop was re-boiled to a blank string-proof for a third crystallisation. Though the second molasses so re-boiled showed in some instances glucose to be already in actual excess of sucrose present, graining was rapid and copious and maturity rapidly attained. First sugars were washed with two pints of water, in which is dissolved a minimum of stannous chloride crystals. Seconds and thirds with one pint, more or less.

The average performance of mill and vacuum pan, per actual running hour, the last three seasons, expressed in pounds of commercial sugar, has been:—

	1886-87.	1887-88.	1888-89.
Mill .. .	2,224·87 ..	2,804·98 ..	2,904·04
Vacuum Pan ..	2,558·19 ..	2,738·13 ..	2,731·41

This indicates the maximum capacity of the establishment to be something over 60,000 pounds commercial sugar per diem.

The season's work was, for convenience, arbitrarily divided into five runs two of them on *stubble* and three on *plant* cane.

FIRST STUBBLE RUN.

The cane of this run had nearly all been ground before my arrival at Calumet, and but few analyses of juices were secured. Judging, however, from the analyses made, the juices were the richest of the season, but the cane being second-year stubble, contained a very high percentage of fibre. There was on this account not only a less quantity of juice in the cane, but also a poor extraction of that present, the woody-fibrous cane making good mill work impossible.

The yield, however, was very good, the ratio of glucose to sucrose in the final molasses being higher than any ever reported before by a Louisiana sugar house. Its analysis gave sucrose double polarization 23·56 per cent., glucose 42·09, and purity 29·70.

One thing worthy of much notice, in this run, was the boiling, for third sugar, of molasses in which the glucose was already in actual excess of the sucrose. This molasses contained 33·20 per cent. sucrose and 33·74 per cent. glucose, and gave a massecuite which grained excellently in the wagons, "swung" out well in the centrifugals, and yielded 12·06 pounds of commercial sugar per ton of cane.

The extraordinarily high content of glucose compared with sucrose in the final molasses is probably due in part to a high percentage of

glucose present in the raw juice. Owing to the non-arrival of the chemical apparatus no glucose determinations were made the first run, but since in subsequent work the analyses of the final molasses showed as low percentage of sucrose without as high glucose content, it is reasonable to assume that the glucose in the molasses in question was derived from that originally present in the juice and was not a result of inversion.

SECOND STUBBLE RUN.

On this run the data are more complete than on the previous one. The remarkably good work which had characterised the house in the first run was once or twice slightly interrupted during this run. The most serious mistake made was the neglect of the sulphur machine, by which moist air was admitted freely to the sulphur dioxide after it had passed over the wash water, and, as the conditions were most favourable, there was, in all probability, quite an appreciable amount of sulphuric acid formed. At any rate, the inversion in this run was much greater than in any other, amounting to 4,365.54 pounds of sucrose, being 1.32 per cent. of sucrose present in raw juice. The analysis of the final molasses gave sucrose, 23.78 per cent.; glucose, 32.68, with a purity of 30.87. The sucrose in the final molasses of the second stubble run, it will be noticed, is very little in excess of the sucrose of the first stubble, while there is nearly ten per cent. less glucose, making the content of total sugar in the last run much lower.

It would seem from this work that the glucose present in the juice of the cane did not possess the power to restrain the crystallisation of sucrose that it is commonly supposed to have. With much more glucose in the first run the amount of sucrose is a little less than in the second. Whether this glucose is different from artificially prepared grape sugar in its physical characteristics or whether the restraining power of the latter over crystallisation has been greatly over estimated, are questions that this work would naturally suggest, and it is probable that, with the awakening interest of the Louisiana planter in scientific work, both these questions will, before many years, be settled.

These two runs are noticeable, not so much for the yield of sugar as for the point to which crystallisation is carried. Molasses, which before would have been considered worthless, can now, in view of the work done at Calumet, be profitably boiled again for another crop of crystals.

In boiling for the lower-grade sugars, the massecuite was boiled as stiff as possible without converting it into "taffy." This required a good deal of judgment on the part of the sugar-boiler, and it is to the excellent manipulation of the material at this point that the high yield of sugar is due.

FIRST PLANT RUN.

This was much the largest run of the season, and had the richest cane. The work of the sugar-house was uniformly excellent, the mechanical loss between the juice and syrup being small as compared with the stubble cane, and in other parts of the house scarcely noticeable. Maceration, or the addition of water to the bagasse between the front and back mill was commenced in this run, and a remarkable increase in the yield was derived from it. This will be discussed further on under the head of "maceration." Available sugar, or sugar actually secured, expressed in terms of glucose present in the juice, was 0.82 times the glucose deducted from the sucrose. The final molasses contained 26.80 per cent. sucrose, 30.85 glucose, with a purity of 33.49.

SECOND PLANT RUN.

This run, judging merely from the nicety with which the machinery worked, would have been pronounced the best of the season. Careful chemical control showed, however, that the mechanical losses were proportionately larger than in any other run of the season.

The chemical control carried through this run was, I believe, one of the most complete, if not the most complete of its kind ever attempted in Louisiana. All the products from the raw juice to the final molasses inclusive were carefully analysed, weights and measurements taken at each stage, and the sugar present compared with that of the previous stage. The work was extremely satisfactory, the losses being accurately located and the parts of the house which worked well noticed. The chief and in fact almost the only loss after the juice had been expressed occurred at the double effect. This, owing to the practice of maceration at the mills, was being so worked beyond its capacity that not over 7 to 8 inches of vacuum could be maintained in its first pan, while 27 to 28 were secured upon the second. The difference of the boiling points of the two pans being thus so great, the juice from the first entered the second pan far above the latter's boiling point, and flashed therefore instantly into vapour,

the excess of its sensible heat being absorbed as latent heat. This instituted a current of vapour direct from the liquor feed-pipe towards the condenser evidently sufficiently violent to entrain large amounts of the entering juice in the form of globular spray or mist, which escaped the catch-all.

After the juice had passed the double effect there was only one other place where there was any appreciable loss, the work in the refinery being remarkably good and close. In boiling for third sugar some of the massecuite was boiled too stiff, and about six inches in the bottom of the wagons having been chilled by too low a temperature at or near the floor of the hot room during a spell of cold weather could not be dug out, and had to be melted and run into the molasses. This accounts for the relatively high percentage of sucrose in the final molasses, the analysis of which gave 29.11 per cent. of sucrose, 29.36 glucose, and purity of 36.94.

THIRD PLANT RUN.

In this run, though the chemical control was carried on as systematically as in the previous one, the results were not quite so satisfactory from the fact that a great deal of settlings from the first molasses were carried over from the first plant and worked in with this run. All this was of course measured, analysed, and deducted from the sugar present in the juice, but what the effect was on crystallisation, added as it was to all the different grades of product, it would be impossible to state.

One very serious accident occurred during this run, which delayed the work for three days. The shaft of the back or bagasse roll of the front or three-roller mill was broken, but as the season was so near the end the crop did not suffer from the delay.

The cane worked, being from new, back, stiff, and inadequately drained lands, was comparatively poor, the sucrose being much lower and the glucose much higher than in the previous plant cane runs. A neutral defecation was carried throughout the run, and a good deal of glucose was destroyed, forming probably a compound with the lime, which was broken up and dissolved by the juice. The amount of first sugar secured was very large compared with the sucrose in the juice, and as a consequence the lower grade sugars did not crystallize as well as in the other runs, much of the grain in the seconds being so small that it passed through the sieves of the centrifugals. The

final molasses contained 26.62 per cent. of sucrose, 28.52 glucose, and a purity of 34.44.

The last two runs made with the idea of comparing a neutral with the ordinary Louisiana acid clarification both as to the effect on yield and care of working, will be discussed further on.

SPECIAL INQUIRIES.

One of the things watched with especial interest was the effect upon the juices from the use of sulphur dioxide as a depurator.

No data on this subject have ever been collected in Louisiana in practical sugar-house working. Laboratory practice has, of course, made us familiar with the danger attendant upon the use of sulphur, if not properly handled.

The Louisiana experiment station, under the direction of Dr. Stubbs, has strongly condemned its use, without suggesting anything to take its place, and, judging from the published reports of the station, the loss there was much greater than any sugar-house could afford.

In endeavouring to find out how great the inversion was at Calumet, analyses were made three times daily of the raw, sulphured, and clarified juices throughout the season. Samples were also taken from each tank of syrup and from the different grades of sugars and the final molasses, and in two runs of all the intermediate products. As all these different products were carefully weighed or measured, any increase in the glucose would be quickly noticed. The analyses of both raw and sulphured juices are, I conclude from the season's work, unnecessary, and either the one or the other should be dropped, thus reducing the chemist's work a great deal and eliminating nothing essential.

Of course where the sulphured juice is heated before being run into the clarifiers both juices should be analysed. Enough sugar would, however, be inverted by this treatment, I should say, to speedily induce anyone to stop its use.

As a result of Calumet's work, I cannot but be very favourably impressed with the use of sulphur as an aid in improving the quality of the output of a sugar-house.

The total inversion for the crop was 6,111.91 pounds sucrose, of which a loss of 4,865 pounds as already mentioned, was sustained mainly through inattention during the second stubble run. This is undoubtedly a smaller loss than would be occasioned by the use of a bone-black plant that can be operated on any Louisiana plantation.

The entire loss by inversion, with the exception of 317 pounds, was confined to two runs, and in another year's work will be almost entirely overcome by a new arrangement, designed by Mr. Daniel Thompson, for cooling the sulphur dioxide fumes as they come from the furnace.

This improvement was put in at Calumet the latter part of the season, and after its introduction the inversion was practically nothing.

It consists of a box about 18 feet long by 2 in width and depth, which is divided into two parts, the first division containing about 16 feet of 6-inch lead pipe, through which the sulphur fumes passed, and around which cold water was kept continually circulating. This effectually cooled the fumes and allowed the absorption in the second division of the box of any sulphuric acid which had been formed. In this second division the fumes came in actual contact with water, allowing, as mentioned above, the absorption of sulphuric acid, while the sulphur dioxide, having been cooled by the previous treatment, formed no fresh sulphuric acid. A further trap for sulphuric acid, which had been in use with the old sulphur-box, was kept in place and allowed any sulphuric acid present to drop perpendicularly down, on account of its specific gravity, into a suitable receptacle, while the lighter sulphur dioxide is drawn off by suction at right angles into the juice.

After the new arrangement for cooling the fumes had been put in, two runs were made, one with an acid defecation, the other with a neutral. Each run contained a little over 197,000 pounds of sucrose in the juice extracted, and with the acid defecation only 317 pounds of sucrose were lost by inversion, while in the neutral not a pound disappeared from this cause. From this I am led to believe that in another year the inversion caused by sulphuric acid will be entirely stopped, but, since to secure the best results with sulphur the juices must be left a little acid after defecation, there will always be a slight inversion, but the acidity will be from a weaker acid, and will amount to nothing.

That sulphur in cane-juice can be made a dangerous and formidable enemy in the hands of untrained and unskilled workmen cannot for a moment be denied, but when properly and scientifically handled it is one of the most, if not the most, valuable aid in a mill-house. With diffusion it will not be as important, if used at all, as the diffusion juices are usually drawn from the cell at too high a temperature to

admit of its use without great danger of inversion. With mill juices even, when sulphur is used, great care and celerity should always be exercised. Defecate the sulphured juice at once, evaporate the juice to syrup immediately after defecation and from the syrup concentrate to massecuite without stopping, and so on as fast as the lower grades will allow of good results. This, however, is true of any sugar-house, whether sulphur is used or not, and large losses, which are often attributed to some method of manufacture, are due to nothing else but delay in working up the juice after it has been secured. Certainly Calumet, with the highest average season's yield ever reported in Louisiana, and this with an extraction of from 80 to 87 per cent. of sucrose present in the cane, has no reason for changing its treatment of the juice as long, at least, as it continues mill-work. Cheapness and effectiveness are two as good recommendations as anything needs, and both of these can be applied to the use of sulphur at Calumet.

MACERATION AND ITS EFFECT ON YIELD.

The addition of water was begun about the middle of the first plant-run, and as it was thought unnecessary to divide the run, the actual yield of merchantable sugar can not be given exactly, but since a pound of sucrose in the juice meant a pound of commercial sugar the return can be easily figured from the table. At any rate, as the extra amount of sugar secured in the juice is the only way to judge of the good maceration does, everything will be found in the table which is necessary to form an opinion of the work. A gain of 17 pounds of sugar per ton of cane by simply adding 11.94 per cent. of water is an amount of sugar secured in such a way that no planter can afford to overlook it. The only extra expense entailed is the evaporation of the water added, and as at Calumet all the exhaust-steam could not be used before maceration was begun, the extra yield was secured with almost no expense.

The method employed for adding the water is believed to have much in it to recommend itself, and since the manner of doing anything has as much to do with success as the mere fact of doing it, the method will be given in full. The water was ejected from a perforated pipe upon the bagasse as it was being released from the pressure of the front mill.

It was argued by Mr. Wibray J. Thompson, and rightly, too, in my opinion, that during the expansion which follows this pressure the bagasse is more likely to thoroughly and uniformly absorb the added

water, as it is known to do such juice as passes through the mill, than at any subsequent period, a minimum of water thus being made to produce maximum results and a maximum of time afforded for diffusive and osmogenic action before entering the second mill. The water added and the juice present in the bagasse from the front mill should, he thought, become a homogeneous liquor practically resembling the normal juice in every particular except in having a lower specific gravity. It can readily be seen that this juice of a uniform quality would give a higher extraction of sucrose than if the water be added indiscriminately at any point of the intermediate carrier, supersaturating some of the bagasse and not reaching other parts at all, which would give a smaller extraction of sucrose with a higher dilution, since from that part of the bagasse which was supersaturated an excess of water would be expressed, while an excess of juice would be left behind in parts insufficiently saturated or diffused.

By carefully observing these conditions the yield of sugar, as was mentioned before, was increased 17 pounds per ton of cane. This is an enormous advance over ordinary mill work, but on an estimate of what diffusion would have done with the same cane and a 96 per cent. extraction, which can easily be obtained, a net gain over maceration of 23 pounds of sucrose per ton of cane would have been made. Thus, while it can be seen that maceration is of great advantage, it is at its best only a temporary expedient to be used till plantation owners can prepare their sugar-houses for diffusion.

The most effective and economic maceration will require a dilution of about 15 per cent. on the weight of normal juice, while diffusion needs but little more. Multiple effect evaporation is, then, as necessary for maceration as for diffusion, and without this aid the expense and loss of sucrose during evaporation would not be balanced by the return of sugar. The chances for extremes of dilution are much greater in maceration than by diffusion, allowing both to be in charge of inexperienced persons, and taken all in all, though the gain by good maceration is great, where a house has to be changed at all for either of the two processes, there should not be the slightest hesitancy in choosing diffusion. Easy to handle and effective, the latter has everything in its favour, and, since it has been proven that the exhausted chips can be burned, there is nothing against it. Come it will sooner or later, and he who introduces it first will reap the greatest benefit.

AVAILABLE SUGAR.

While in my opinion it is unnecessary and useless in sugar-house work to have an arbitrary formula for predicting results, as from the very nature of the material nothing constant can be secured, still as it has hitherto been customary by the Department to use some such standard, I will report Calumet's work in the same way. The formula which has been mostly used for this purpose has been one and a half times the glucose present in the juice deducted from the sucrose. The product thus expressed is sugar of 100° polarization, which should go to market as crystal.

At Fort Scott, campaign of 1887, working sorghum cane, the crystallized product obtained was expressed by deducting 1.42 times the glucose from the sucrose, this being slightly better work than according to the ordinary formula. The following table gives the results of each of the five runs into which the campaign was divided at Calumet. This table gives both the amount of sugar according to the regular formula and that which was actually secured; also a formula expressing the results. It will be seen that even in the one sugar-house the widest variations exist.

	Pounds of sucrose —1.50X glucose.	Pounds of sucrose actu- ally secured.	Formula for available sugar.
First stubble .. Analysis of juice not complete.			
Second stubble ..	348,986.68 ..	361,574.02 ..	Sucrose—1.04Xglucose.
First plant	696,189.62 ..	727,071.90 ..	Sucrose—.81Xglucose.
Second plant	177,438.40 ..	180,625.35 ..	Sucrose—1.25Xglucose.
Third plant	171,153.93 ..	188,066.89 ..	Sucrose—.53Xglucose.
Total crop ..	1,393,768.53 ..	1,457,338.16 ..	Sucrose—.87Xglucose.

This is up to the present time the best work with cane-juice ever published, there being a difference of .55 between Calumet's average factor for available sugar and that of the Fort Scott works, the latter the best previously recorded.

NEUTRAL *versus* ACID CLARIFICATION.

In all Louisiana sugar-houses where sulphur is used the juices are left slightly acid for the purpose of securing an improved colour in all the products from first sugar to final molasses inclusive. This practice is followed both in open-kettle and vacuum-pan sugar-houses.

The great trouble in working such juices is, naturally, the inversion caused by the presence of a free acid. A very slight acidity is all that

is necessary to secure the desired colour in the production of yellow clarified sugars, but even in skilled hands this acidity is very difficult to control, and under the charge of the ordinary Louisiana clarifier-man the juice is left first at one extreme and then at the other, with a tendency always to the more acid juice.

In the manufacture of white sugar the evil is, of course, intensified by higher degrees of acidity sought. The lack of knowledge and care has been so marked in most cases that the owners themselves were ignorant even that it was possible for such a loss to occur.

Only in a few places, and even in these but for a few years, have any attempts been made to give the juice a practical chemical treatment. In most places where this has been done a considerable inversion has been found in working the acid juices. To overcome this loss by inversion the juices are limed to neutrality. This practice however, lowers the quality of the sugar, for as soon as the juice loses its acidity it fails to give so brilliant a sugar, because of the formation of calcic glucates and other dark-coloured compounds; hence it is necessary that a sufficient amount of additional sugar be recovered by the neutral clarification to overcome the difference in price of the sugar from an acid clarification.

The last two runs of the season were selected for a trial of the relative merits of the two methods of clarification.

The selection of these two runs for the trial proved to be a very unfortunate one, the difference in the quality of the cane being very marked. With no other difficulty than this a strict comparison of results would be impossible, but coupled to this the mechanical loss at the double effect in the acid run was the largest of the season, while in the neutral it was the smallest. This loss cannot, in my opinion, be attributed to the different methods of clarification, but merely to the handling of the double effect. Even if the different losses in the two runs were due to the different viscosity of the juices, as was suggested might be possible by Mr. W. J. Thompson, the loss itself will be entirely avoided in another year, and ought not to enter into a discussion of the results.

As far as a loss by inversion is concerned, there need be no discussion, because by either process there was at Calumet no such loss, or practically none, the acid run having only 317 pounds, which is too small to be considered, and the neutral having none of course. This absence of inversion in the acid run disposes of the most im-

portant objection to that method of clarification, and reduces the discussion to the comparative amount of sugar recovered by the two methods and the market value of the product after it is recovered. In the acid run 91.61 per cent. of the sucrose in the juice was put on the market as crystallized sugar, while in the neutral 95.31 per cent. was recovered. If, however, the mechanical loss at the double effect, mentioned above, had been the same the sugar obtained would have been very nearly equal, while all the products of the acid clarification had from .062 to .25 cents per pound the advantage in price on the gross sales.

As far, then, as this season's work was carried at Calumet the advantage lies entirely with the acid clarification. By careful and expeditious working of the juice, inversion was almost prevented; as large an amount of sugar can be recovered from the juice and the market value of the products is invariably higher.

The exceptionally fine record made by Calumet is worthy of more than passing notice. As mill work it is unprecedented, having surpassed anything which has heretofore been thought possible. The extraction of juice was not phenomenally high, though after maseeration was began it was much above the average, but the manipulation of the juice after it was once secured was remarkably good. The machinery was well arranged and worked admirably, and to the arrangement is due much of the credit, as it allowed an ease and speed in working which otherwise could not have been attained.

The one noticeable mechanical loss was at double effect. The loss here was larger than thought possible, but the most careful measurement and analyses of the material, both before and after entering the double effect, only confirmed the disappearance. During the campaign 30,431 pounds, or 1.97 per cent. of the sucrose extracted disappeared at this place. A portion of this loss is really due to the press-cake, but as this was carefully lixiviated from two to three hours all through the campaigns, the sucrose lost in this way was but a small amount. No analyses of cake were made, as the presses gave no trouble whatever at any time, and the other work was thought to be more important. Steps have been taken to stop this loss during the next campaign. A Helix separator is to be attached to the condenser pipe, and it is expected that this will arrest the spray and return it to the pan,

From the syrup to the final product it is hard to see how the

work could be improved. The most noticeable feature, and the one, I think, to which the high yield may be attributed, was the remarkable stiffness to which the massecuites were boiled. In all grades of the material as much water was driven off as was thought safe to do. By this remarkably good boiling an amount of sugar was recovered which leaves absolutely no room for comparison with the work of other Louisiana sugar-houses. This is a record to be proud of, and the enterprising proprietor of Calumet, Mr. Daniel Thompson, and his son, Mr. W. J. Thompson, director of the sugar-house, deserve unstinted praise for showing the possibilities of cane culture in Louisiana when the manufacturing is carried out on a rational basis.

What has been done can be done again, and when the Louisiana planter adopts diffusion and carries his sugar-house work to such a degree of perfection as has already been attained at Calumet, it will be no unusual thing to hear that 250 pounds of sugar have been obtained from a ton of cane.

SACCHARINE, IS IT INJURIOUS TO HEALTH?

The inventors and manufacturers of saccharine, Herren Fahlberg, List & Co. have for some time been publishing lists of opinions received from a number of eminent medical men and physiologists, to the effect that saccharine produces no injurious effects on the human system. The following, which is from a French physician, may be adduced as a sample: "Considered from the therapeutic standpoint, saccharine forms a valuable acquisition, and we cannot do less than place a high value on its employment, whether as an anti-fermentative medicament, or above all as forming part of the hygiene of diabetic patients." Whatever may be the value of this substance from a medical point of view, the fact of the prohibition in the principal countries of Europe (except Germany and Austria), of its use in any other form than as a drug to be prescribed by physicians, shows that it is not likely to have much chance of exercising the injurious effect which so many doctors, especially in France, have attributed to it. It is probable that, like a distantly connected but partly analogous product, derived also from coal tar, known by the name of antipyrine, its effect will vary very much in different individuals.

THE SUGAR INDUSTRY IN MEXICO.

A group of capitalists in Chicago are engaged in establishing a large refinery at Linares, in the State of Tamaulipas. It will be the first large establishment of this kind which has been established in Mexico. Ten waggons load of machinery have already arrived at the place where the buildings destined for the refinery are to be set up. The Company has made contracts with the cane planters in the neighbourhood of Linares, by which the latter engage to supply certain quantities of raw sugar. On the other hand, we hear that the estate of Cuahuistla, in the State of Morelos, has been sold to American speculators.

Of late years, it must be confessed, a spirit of enterprise has been awakened among Mexican planters; new establishments have been set up in different parts of the country; large estates have been created on the banks of the Rio Fuerte, in the districts of Tepic and Tamaulipas. In the States of Morelos, La Puebla, and especially Jalisco, the planters have improved their implements and machinery; in the States of Vera Cruz, some enterprising men, amongst others General Pacheco, have made earnest attempts to raise the sugar industry from the primitive state in which it had been for centuries. Much, however, remains to be done before Mexico, which up to now has confined itself to the manufacture of sugars consumed in the interior of the country, can figure in European and American statistics as an exporter of this product.

The American companies which propose to carry on the sugar industry in Mexico will certainly not contribute to the attainment of this end, as the export of refined sugar is becoming more and more difficult; but the fact of their establishment, and especially the erection of this Linares Refinery, will no doubt have the immediate result of supplying the country with a product superior to that which it is at present consuming, and next of contributing in a great degree to the development of agriculture in Mexico.

The agricultural industry connected with sugar, as it has hitherto been carried on in Mexico, and having for its object the supply of a product for immediate consumption, has been a cause of ruin to many planters. There are in fact very few of them who can bear the united cost of the expenses of cultivation, the profit from which is only to be realized after two years, and of the setting up, maintenance, and working of the machinery and plant, which are still greater than the former.

The establishment of large refineries will modify this state of things; the planter will be relegated to his true position, that of a cultivator. Works costing but a small sum, and industrial operations of the most simple nature will suffice, and a very small portion of the capital thus liberated will be enough to permit him to improve his implements and his land. We predict that he will derive more profit from these reforms than from setting up machinery, which his limited means and want of knowledge will render almost always insufficient.

But though the creation of refineries will enable the sugar industry to make a step in advance, it is not sufficient to give it the considerable importance which it ought to acquire in a country placed in similar if not superior circumstances, as a producer of sugar, to the French and Spanish Antilles, Réunion, and the East Indies.

In order to show that it is possible for Mexico one day to raise herself to the level of these latter countries as a producer of sugar, we shall not look for examples in certain districts, specially privileged in this respect, which abound all over the territory of the Republic. It is even probable that if we were to make a presentment, as truthful as possible, of the yield per hectare in canes on certain lands, and the yield of sugar from those canes, we should reach such figures that we should not be believed by those who have dealt with these questions outside of Mexico. We will then confine ourselves to naming the lands in the State of Morelos, which are at this moment giving an average yield in canes to that of the Cuban estates, and yet these districts in the State of Morelos, some of which were worked by Hernan Cortes, have for ages received only a ridiculously small quantity of manure; no one has given himself the trouble to produce simple farm manure for them; as to artificial manures, up to now not a grain has been introduced into the whole estate.

Thousands of acres are being scratched over, we will not say worked, with admirable care; they are the pride of the local cultivators, but any deep working of the soil is almost unknown; the use of improved ploughs is very limited; and, lastly, a portion of the fertilising principles of the soil is often washed out and removed by energetic irrigation. In spite of all this, the yield is such as we have indicated, and on plantations where intelligent management has introduced real improvements, the yield in canes has been more than doubled, and has sometimes reached the enormous figure of 200,000 kilos. per hectare (about 80 tons per acre).

If these results have been obtained in the State of Morelos, we certainly have a right to hope that the results would be still more remarkable in more favoured regions, in virgin soil, and with energetic cultivation. The day will certainly come when these districts which, we once more state, abound in Mexico, will be worked; a large company would have a profitable task in acquiring wide stretches of land fit for cane growing, and in attracting thither emigrants and giving them the means of becoming cane-planters. The company would buy the canes, and manufacture raw sugar for export.

The large sugar factories in Europe buy beets from the farmers in their neighbourhood; the central works of Martinique and Guadeloupe buy the canes from the small planters. This kind of business proves profitable to all concerned.

It is to be hoped that the American company which is being located at Linares will have its imitators, but that the latter, going a step further than their predecessors, will buy the products of the soil direct. We should then see districts, where at present nothing is met with but maize sold at poor prices, because of its abundance, and where hands exist in sufficient quantity for the purpose, transformed into producers of one of the articles of commerce most appreciated in the world.—From the *Trait d'Union*.

CONSUMPTION OF SUGAR IN THE UNITED STATES.

	Tons.	Lbs. per head.
1878.....	773,472	35·7
1879.....	831,896	37·4
1880.....	997,109	39·9
1881.....	1,008,932	42·5
1882	1,070,920	45·3
1883.....	1,164,391	47·4
1884.....	1,265,283	49·7
1885.....	1,245,574	48·9
1886.....	1,389,079	51·8
1887.....	1,397,356	52·2
1888.....	1,469,997	53·1

The mode of calculating the consumption in the United States is different from that adopted in Europe, and the quantities must be regarded as only approximative. Probably the above figures represent the full amount, and may even be somewhat in excess, if we are to believe some statisticians.

ON THE MANUFACTURE OF GREY SUGAR AT THE
ST. MADELEINE WORKS, TRINIDAD.

BY GEORGE BARTSCH.

Communicated to the *Deutsche Zuckerindustrie*.

In continuation of my former report "On the Manufacture of Yellow Crystals in Demerara" (see *Sugar Cane* for October), I now give a description of the manufacture of "Grey Sugar," which is manufactured specially, and on the largest scale at the St. Madeleine Works.

The sugar crystals are just as large as those of the Demerara product, but the colour is greyish brown. It is sold to refineries as the best raw sugar. The price which it fetches is from one to two shillings per cwt. lower than what is got for yellow Trinidad sugars. Before going into the details of the mode of manufacture, I will give a short description of the extent of the plantation in question.

The St. Madeleine Works are situated in a little valley near the town of San Fernando, with which they are connected by a railway. Around it lie the cane plantations belonging to it, viz.:—Petit Morne, Unionhall, Corinth, Golconda, Les Efforts, Cedarhill, and, somewhat further to the north of San Fernando, Plein Palais. All these plantations are connected by railways with the central factory. There are seven medium-sized locomotives and several hundred waggons, each carrying a load of about six tons, at work. Total length of rails, about 36 English miles. The manager of these plantations has also a number of concrete and muscovado plantations under his direction.

As regards the area under cultivation, it is about 3,340 acres, divided amongst the plantations already named. Well-kept roads also exist between the factory and the plantations. There are about 2,400 labourers employed, mostly Indian coolies. On the whole the conditions under which the work is carried on are not so favourable as in Demerara. In addition to the cane obtained from the plantations, the factory buys cane from negro cultivators at from 7s. to 8s. per ton.

For loading sugar on sailing vessels the plantations have a wharf on the River Cipro, a small stream which runs into the Gulf of Paria; there is a rail also from the factory to the wharf, where are situated also a cooperage for making rum casks and sheds for the railway

waggon. The loading of the sugar and the unloading of coal is carried on by means of three lighters, which are required because of the ships being obliged to anchor at some distance from shore, owing to the shallowness of the water.

The water supply here is, as everywhere in Trinidad, very bad; two large artificially constructed tanks provide what water is required. There are also two large series of drying slopes for the purpose of utilising again the water used in condensation, over which the heated condensation water is pumped to be again cooled by the sea breeze.

The conduct of these large plantations is committed to one general manager, numerous sub-managers, overseers, and engineers, whose yearly salaries amount to about £6,000.

The canes, after cutting, are conveyed to the railway depôts on two-wheeled mule carts. Fresh canes are planted every third year, the first cane is called plant-cane, and the yield is about 24 to 30 tons per acre. The new cane, which springs next year from the roots, the so-called first ratoons, yields about 17 to 19 tons, that which is obtained in the third year from the same plants, the second ratoons, yields 15 to 17 tons per acre.

If there were more labour obtainable, probably fresh plantings would be made oftener, as the yield from old cane falls off year by year.

Artificial manures are little or not at all used, the scum from the defecator only being put on the fields as manure. The cost of cultivation per acre of canes, consisting of rent (or interest) of land, salaries, wages, cost of draught animals, &c., may be put at about 40 dollars (£8). The agricultural operations in the case of plant-canes consist of once digging, planting and filling up the gaps, four times hoeing, cutting and loading. The costs are the same with the first and second ratoons, less the expense of planting.

The planting out is begun in January and should be completed in May. The cutting of the canes commences in January, and comes to an end at the middle of April. In 1888, 65,600 tons of cane were cut from 3,340 acres.

Before passing to the mode of producing grey sugar, I would point out that the composition of the cane juice is much superior to that of the Demerara juice, on the other hand the quantity of the cane obtained is much smaller than there. This may arise principally from the hilly nature of the country, the soil in itself is as productive in Trinidad as in Demerara.

The arrangement of the factory corresponds with the extent of cultivated surface to which it is attached, and which for some years has reached 4,500 acres. The building, constructed entirely of iron, is surrounded by rails, a small receiving station with a telephone to the whole of the plantations facilitates the supply of the cane.

The necessary steam is supplied by 12 tubular boilers with the Léon Marie Patent firing, the smoke gases escape through two chimneys. The bagasse, containing from 5 to 7 per cent. of sugar, and coal brought from England are used as fuel, and from $2\frac{1}{2}$ to 3 tons of coal are consumed for every 100 tons of cane.

Two large three-rollered mills, driven by beam engines, crush the cane, and when in full work 100cwts. of cane give 66 to 68cwts. of juice, which in 1889 showed a saccharine content of 13.91 to 16.70 per cent., with from 1 to 1.60 per cent. of glucose. The acid content in 100 ccm. of juice, calculated on 1/10 N.N., varied between 0.94 and 1.57 ccm., the cane sugar quotient between 78 and 86 per cent. The much smaller quantity of glucose as compared with that contained in the Demerara juice is striking.

With a daily crushing of 1,000 tons, about 138,000 galls. of juice are obtained; this passes through two fine copper sieves in order to clear it from the coarser fibres, and is then driven to the heater by a pump attached. The heating in these is supplied by the waste steam of the mill engines, while the waste steam of the other engines passes into a return steam collector.

The heated juice goes warm into the boiling pans, and lime water is there added.

As no method was observed in the addition of the lime, I endeavoured, with some success, to measure the quantity of lime in this case also, by means of the quantity of acidity of the juice. According to my experiments, there was added as much lime water of 17° Bé. as would correspond to the obtaining of an acidity of 0.20 ccm. in 100 ccm. of juice, 1/10 N.N. The quantity of lime water added varied between 14 and 35 pints to 830 gallons of juice.

Further, I observed here also that a large excess of lime is necessary to produce an alkaline re-action, and that a large portion of the acid indicated is only very loosely united to the lime. The principle action in the defecation was in this case also a mechanical one, and mostly dependent on the formation of phosphate of lime and gypsum. In this stage of working the quotient was raised by about 2 %.

After the defecated juice has been allowed to stand from half to

three-quarters of an hour, the pure clear juice is conveyed to eliminators (see the article on Demerara Yellow Crystals), but it is here treated, in contradistinction to the method pursued in the manufacture of yellow crystals, not with phosphate of lime, but merely boiled thoroughly after a longish time, without any addition.

Considerable browning of the colour takes place, probably owing to decomposition and the formation of Caramel, and the juice is also somewhat tinged by taking up iron and copper. The quotient falls by 1 %; the acidity is slightly increased. The only advantage, which seems dearly bought, is the evaporation of from 3 to $5\frac{1}{2}$ % of water.

The settlings which had remained behind in the defecators, mixed with the exhausted residuum from the eliminators, run into two boiling-vats, and are boiled thoroughly, before being conveyed to the filter presses standing underneath the boilers.

These presses are of English manufacture, without any arrangement for maceration. A Dehne scum pump belonging to them had been turned into a feed pump for the boilers owing to the ignorance of its use. At first the juice would not filter, but after a large quantity of caustic soda had been added until there was a marked alkaline re-action it filtered easily, and the cakes obtained were remarkably solid. From 0.97 to 1 per cent. of scum was obtained on the weight of cane. It is evident that in the case of cane juice, that which is made as alkaline as possible filters best through a press, and this fact is a great hindrance to the introduction of presses in the manufacture of yellow crystals, as in their case the juice would deteriorate in colour. The saccharine content of the scum varies between 9 and 14 per cent., as the steam used for drying the cakes only preserves about 4 per cent. of the sugar.

The filtered juice, added to that from the eliminators, is conveyed by means of a pump into a reservoir and from thence into the triple effect, consisting of four large divisions of almost equal size. This is heated by steam, and evaporates from 28 to 33 per cent. of the water in the juice. The juice, concentrated to about 45 Brix, is now boiled in four vacuum pans, each of which possesses its own air pump. The amount of water evaporated in the vacuums is about 60 per cent. of the juice. These are heated either with direct or return steam.

The massecuite obtained is short and sharp grained, the crystals are large. It is emptied into large movable vats and at once centrifugalled warm. The 12 centrifugals in use are Weston's; the sugar obtained is at once carried to a strainer by means of an elevator,

put into sacks, and conveyed to the loading wharf. It polarises 96° to 97° , contains but little ash and glucose, is sharp grained, of a brownish grey colour and has a pleasant taste. About 60 to 63 per cent. of the massecuite is obtained in first product sugar.

Lime is added to the syrup running off from the first product, until the reaction is alkaline, and the whole is boiled until it stands the string test. After fourteen days the crystallisation is complete. If the runnings are not made quite alkaline before being boiled, then a fermentation ensues, which disappears at once if the clarification is properly conducted, and the syrup treated as above and not boiled too thick.

The sugar centrifugalled from the second massecuite polarises 84 to 91 per cent. with $5\frac{1}{2}$ to 7 per cent. of glucose.

Lime is again added to the running from the second centrifugalling, the boiling is regulated by the string test and the whole centrifugalled after standing three months. The large crystallising tanks, erected by a German, proved excellent. The No. 3 sugar obtained is similar to the second product, but both second and third products are darker than the after products in the yellow crystals manufacture. The syrup from the third centrifugalling is converted into rum by Mr. Scard's Patent.

As regards the yield in sugar obtained, the following may be remarked. In 1887-88, as already stated, the quantity of cane brought to the mill was 65,000 tons; from this were obtained:—

	Tons.	Per cent. of the weight of Cane.
1st Product	4,728	= 7.20
2nd ,,	1,096	= 1.67
3rd ,,	276	= 0.42
Total Sugar	6,100	9.29

The saccharine content of the juice in the year in question was better than in 1889.

The wages of the factory alone, at the cheap rate of pay which is current there, amount to about \$1,550 per week, in which amount the wages for field labour are not included.

The gross profit obtained allows the Directors to pay so high a price for the contract cane, that the cost of production is well covered. The net profit is about $2\frac{1}{2}$ d. per cwt. of contract cane.

There are, of course, large repairing workshops of every kind attached to the plantation.

The above is a concise description of the largest sugar plantation in Trinidad, which belongs to the notable sights of an island that is also most richly endowed with natural beauties.

IMPORTS AND EXPORTS (UNITED KINGDOM) OF RAW AND REFINED SUGARS.

JANUARY 1ST TO OCTOBER 31ST, 1888-1889.

Board of Trade Returns.

IMPORTS.

RAW SUGARS.	QUANTITIES.		VALUE.	
	1888.	1889.	1888.	1889.
	Cwts.	Cwts.	£	£
Germany	3,784,204	4,660,563	2,464,871	3,782,713
Holland	254,770	384,337	163,235	320,427
Belgium	491,392	786,566	312,579	542,150
France	16,201	169,018	11,932	140,961
British West Indies & Guiana	1,856,195	1,537,648	1,475,746	1,467,502
British East Indies	968,037	1,684,326	465,849	1,145,992
China and Hong Kong	10,733	40,774	6,420	31,716
Mauritius	245,729	291,050	166,272	285,079
Spanish West India Islands	304,496	49,535	223,544	44,230
Brazil	2,132,549	702,058	1,341,821	502,381
Java	3,198,906	1,788,072	2,383,005	1,612,262
Philippine Islands	641,954	928,709	305,140	555,056
Peru	430,455	579,937	319,297	479,338
Other Countries	635,281	630,191	463,498	555,899
Total of Raw Sugars ..	14,970,892	14,232,784	10,103,209	11,475,706
Molasses	327,391	361,777	102,090	134,831
Total Sugar and Molasses .....	....	....	10,205,299	11,610,537
REFINED SUGARS.				
Germany	2,318,268	3,253,137	2,021,522	3,367,371
Holland	1,160,777	1,073,133	1,051,526	1,111,314
Belgium	163,698	194,163	155,991	206,980
France	804,057	1,621,020	723,319	1,687,883
United States	40,352	10,018	37,713	9,713
Other Countries	391,374*	630,565*	311,429*	632,115*
Total of Refined	4,878,526	6,782,036	4,301,500	7,015,376
EXPORTS.—REFINED SUGARS.				
	Cwts.	Cwts.	£	£
Sweden and Norway	64,248	60,920	53,254	55,469
Denmark	81,372	105,974	59,925	84,187
Holland	72,486	76,001	52,857	63,739
Belgium	25,400	23,609	17,685	17,864
France	6,512	5,813	4,546	4,599
Portugal, Azores, & Madeira	62,154	68,640	45,189	56,264
Italy	76,222	82,582	56,332	71,637
Other Countries	167,556	126,678	130,675	114,114
Total of Exports	555,950	550,217	420,463	467,873

* Imported almost entirely from Russia.

IMPORTS OF FOREIGN REFINED SUGAR.

The British Sugar Refiners' Committee furnish us with the following figures, giving the imports of foreign refined sugar for the month of October, 1889, compared with the corresponding month of the two preceding years, and the average monthly imports for the year compared with those of 1886, 1887, and 1888, distinguishing the quantities of "Lumps and Leaves" from "other sorts," and giving the separate imports from each country:—

Countries from which Sugar has been imported.	" LUMPS AND LOAVES."							" OTHER SORTS." Including Crushed Loaf, Granulated, Crystallized, &c.							TOTAL.					
	Monthly Average.			Oct.	Oct.			Monthly Average.			Oct.	Oct.			Monthly Average.			Oct.	Oct.	
	1886	1887	1888	1889	1887	1888	1889	1886	1887	1888	1889	1887	1888	1889	1886	1887	1888	1889	1888	1889
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
France.....	1462	1363	1686	1975	981	1416	3027	2688	5090	4856	6128	2499	10037	16752	4150	6462	6541	8163	3460	11453
Holland	3508	3780	3287	2263	4403	3001	2527	1428	2483	2675	3111	2950	3609	4935	4386	9263	5942	5304	7302	6610
Germany & Austria ..	990	1347	1510	2502	353	446	2348	6634	10463	11726	13762	8059	5940	11066	7624	11810	13238	16264	8412	6386
Belgium	344	592	622	759	679	444	716	113	308	227	210	261	211	223	457	900	849	969	940	655
United States	864	454	8	..	74	..	..	5078	2804	167	49	93	10	6	5832	3258	165	49	107	10
Russia .....	..	3	..	27	..	..	..	3412	452	1959	2112	1127	87	50	3412	455	1969	2439	1127	87
Other Countries ....	..	..	1	287	..	..	..	9	15	2	426	..	..	110	9	15	3	713	..	..
Total	7158	7539	7094	7803	6470	5307	8618	19362	27634	27604	26008	14998	10887	33142	26550	29163	28608	33901	21468	25201
															26550	29163	28608	33901	21468	25201

SUGAR STATISTICS—GREAT BRITAIN.

TO NOVEMBER 16TH, 1889 AND 1888. IN THOUSANDS OF TONS, TO THE NEAREST THOUSAND.

	STOCKS.		DELIVERIES.		IMPORTS.	
	1889.	1888.	1889.	1888.	1889.	1888.
London	52	.. 28	279	.. 275	304	.. 254
Liverpool ..	92	.. 106	269	.. 288	266	.. 308
Clyde	30	.. 15	212	.. 219	222	.. 193
Bristol	3	.. 2	47	.. 44	47	.. 41
Total ..	177	151	807	826	839	796
Increase ..	26		Decrease ..	19	Increase ..	43

SUGAR STATISTICS—UNITED STATES.

(From Willett and Hamlin's Circular.)

FOR THE FOUR PRINCIPAL PORTS. IN THOUSANDS OF TONS, TO THE NEAREST THOUSAND. FOR OCTOBER, 1889 AND 1888.

	STOCKS.		DELIVERIES.		IMPORTS.	
	November 1st.		In October.		In October.	
	1889.	1888.	1889.	1888.	1889.	1888.
New York	28	.. 44	45	.. 47	41	.. 41
Boston	2	.. 6	3	.. 13	2	.. 13
Philadelphia....	..	.. —	18	.. 12	18	.. 10
Baltimore .....	..	.. ..	..	.. ..	..	.. ..
Total	30	50	66	72	61	64
Decrease ..	20		Decrease ..	6	Decrease ..	3
Total for the year			901	931	899	933

NEW YORK PRICES FOR SUGAR.

From Willett, Hamlin & Co.'s Report, November 14th. 1889.

FAIR REFINING.	96c/o CENTS.	GRANU- LATED.	STAND. A.	STOCK IN FOUR PORTS.
Nov. 14, 1889.—4½c.	5½c.	6½-15-16c.	6½c.	Jan. 1, 1889— 32,254 tons.
Nov. 15, 1888.—5 1-16c.	6½c.	7½c.	6½c.	Jan. 1, 1888— 47,798 tons.
Nov. 17, 1887.—5 3-16c.	6c.	6½-11-16c.	6 5-16c.	Jan. 1, 1887—102,279 tons.
Nov. 18, 1886.—4½c.	5½c.	5 11-16c.	5½c.	Jan. 1, 1886— 57,328 tons.
Nov. 19, 1885.—5½c.	6c.	6½c.	6 3-16c.	Jan. 1, 1885— 89,186 tons.
Nov. 13, 1884.—5c.	5½c.	6½c.	5 13-16c.	Jan. 1, 1884— 60,900 tons.
Nov. 15, 1883.—6½c.	7 9-16c.	8½c.	7½c.	Jan. 1, 1883— 50,297 tons.
Nov. 16, 1882.—7½c.	8c.	8½c.	8½c.	Jan. 1, 1882— 43,927 tons.
Nov. 17, 1881.—8½c.	8 13-16c.	9 11-16-¾c.	9½c.	Jan. 1, 1881— 66,999 tons.
Nov. 11, 1880.—7½c.	8½c.	9½c.	8½-9c.	Jan. 1, 1880— 63,558 tons.

STOCKS OF SUGAR IN THE CHIEF MARKETS OF EUROPE ON THE
31ST OCTOBER, FOR THREE YEARS, IN THOUSANDS
OF TONS, TO THE NEAREST THOUSAND.

Great Britain.	France.	Holland.	German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1889.	TOTAL 1888.	TOTAL 1887.
157	97*	8	180*	110	1	569	429	646

* Estimate.

CONSUMPTION OF SUGAR IN EUROPE FOR THREE YEARS, ENDING
31ST OCTOBER, IN THOUSANDS OF TONS, TO THE
NEAREST THOUSAND.

Great Britain.	France.	Holland.	German Empire.	Austria.	Remaining four principal entrepôts.	TOTAL 1889.	TOTAL 1888.	TOTAL 1887.
1292	461	38	427	234	350	2802	2729	2668

ESTIMATED CROP OF BEET ROOT SUGAR ON THE CONTINENT OF EUROPE
FOR THE PRESENT CAMPAIGN, COMPARED WITH THE ACTUAL CROP,
OF THE THREE PREVIOUS CAMPAIGNS.

(From Licht's Monthly Circular.)

	1889-90.	1888-89.	1887-88.	1886-87.
	Tons.	Tons.	Tons.	Tons.
France.....	650,000 ..	466,767 ..	392,824 ..	485,739
German Empire ..	1,175,000 ..	990,604	959,166 ..	1,012,968
Austro-Hungary..	720,000 ..	523,242 ..	428,616 ..	523,059
Russia and Poland.	490,000 ..	537,000 ..	441,342 ..	487,460
Belgium	180,000 ..	145,804 ..	140,742 ..	135,755
Holland	55,000 ..	46,040 ..	39,280 ..	36,098
Other Countries..	60,000 ..	55,000 ..	49,980 ..	49,127
Total....	3,330,000	2,764,457	2,451,950	2,730,206

Mr. Licht has (as he intimated might be necessary) now raised his estimates for the 1889-90 production. See remarks on next page.

STATE AND PROSPECTS OF THE ENGLISH SUGAR MARKET.

Prices for cane sugars are, as a rule, somewhat lower than last month, and an opinion appears to prevail that they are in certain cases too high as compared with those for beet sugars.

Beet sugars remain in about the same position as at the end of last month. The publication of the higher estimates produced a quietening effect on business with a weakening tendency, from which there has been a slight recovery.

Russian crystals are neglected. French loaves and cubes are lower; some fine French loaves were bought last week for long date delivery as low as 15s. 9d.

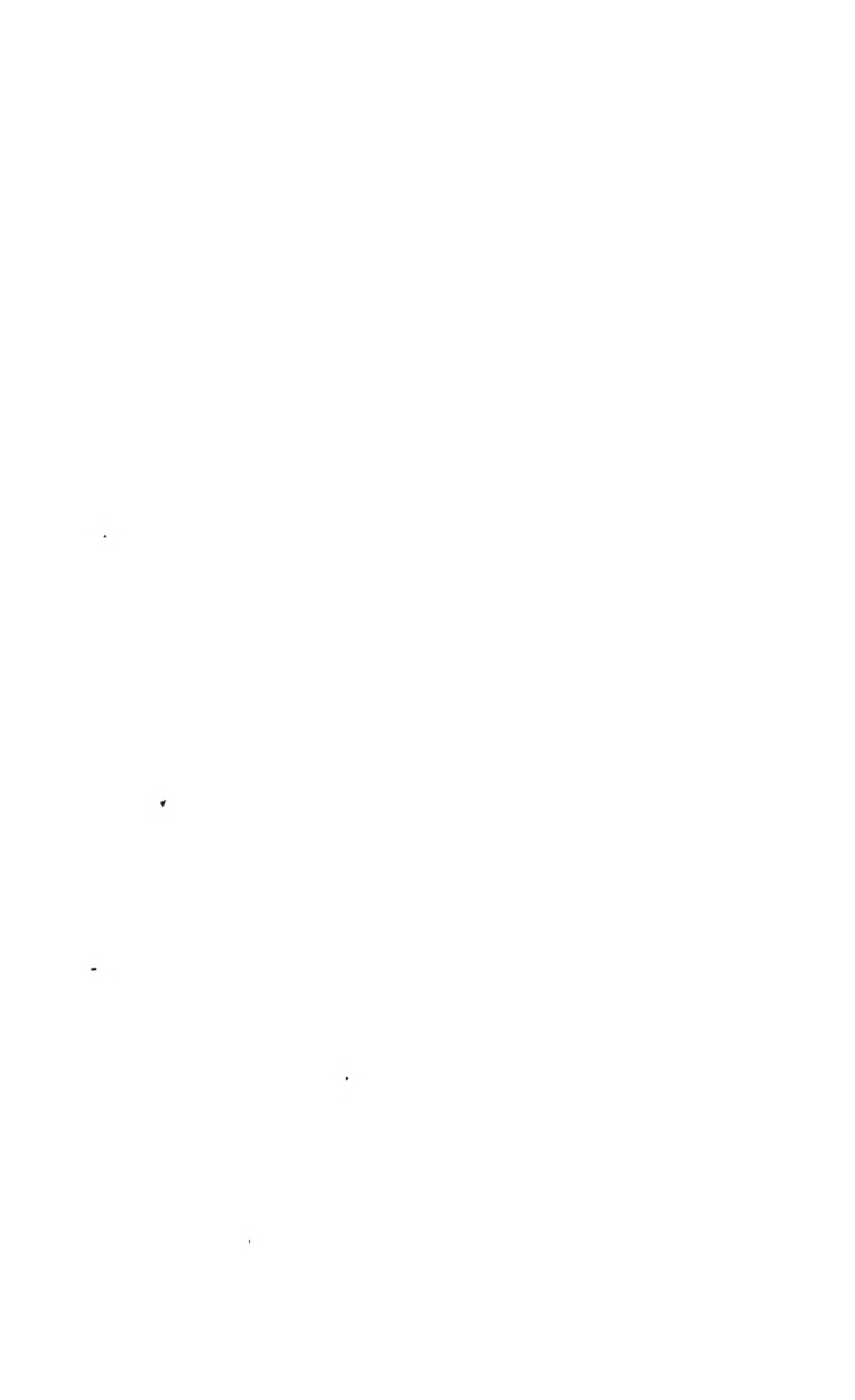
Mr. Licht's estimate of the year 1889-90 production of beet sugar is now 3,330,000, being an advance on last month's figures of 160,000 tons. Mr. Görz, of Berlin, and the *Prager Zuckermarkt*, also raise their estimates; their figures are 2,943,000 tons and 3,119,000 tons respectively.

The deliveries into the United Kingdom (four principal ports), up to 16th November, show a decrease, as compared with 1888, of 19,000 tons.

Stocks have increased, and are now about 26,000 tons higher than at the corresponding time in 1888.

Present quotations for the standard qualities, as under, are:—

FLOATING.		Last Month.
Porto Rico, fair to good Refining	12/3 to 12/6 against	12/- to 13/6.
Cuba Centrifugals, 97% polarization	14/-	„ 13/6 to 14/-.
Cuba, fair to good Refining	12/6 to 12/9	„ 12/6 to 12/9.
Java, No. 14 to 15 D.S.	14/3 to 14/6	„ 14/3 to 14/6.
British West India, fair brown	11/9	„ 12/- to 12/6.
Bahia, low to middling brown	10/- to 10/6	„ 10/6 to 11/-.
„ Nos. 8 to 9	11/- to 11/6	„ 11/6 to 12/-.
Pernams, regular to superior Americans ..	10/6 to 12/3	„ 11/9 to 12/3.
LANDED.		Last Month.
Madras Cane Jaggery	8/6 to 8/9 against	9/-
Manila Cebu and Ilo Ilo	8/3 to 8/6	„ 8/6 to 8/9.
Paris Loaves, f.o.b.	16/6 to 16/9 against	18/-
Russian Crystals, No. 3, c.i.f.	No business	„ 14/-
Titlers	19/-	„ 20/6
Tate's Cubes.	20/-	„ 21/-
Beetroot, German, 88%, f.o.b.	11/6 to 11/7½	„ 11/6 to 11/7½



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